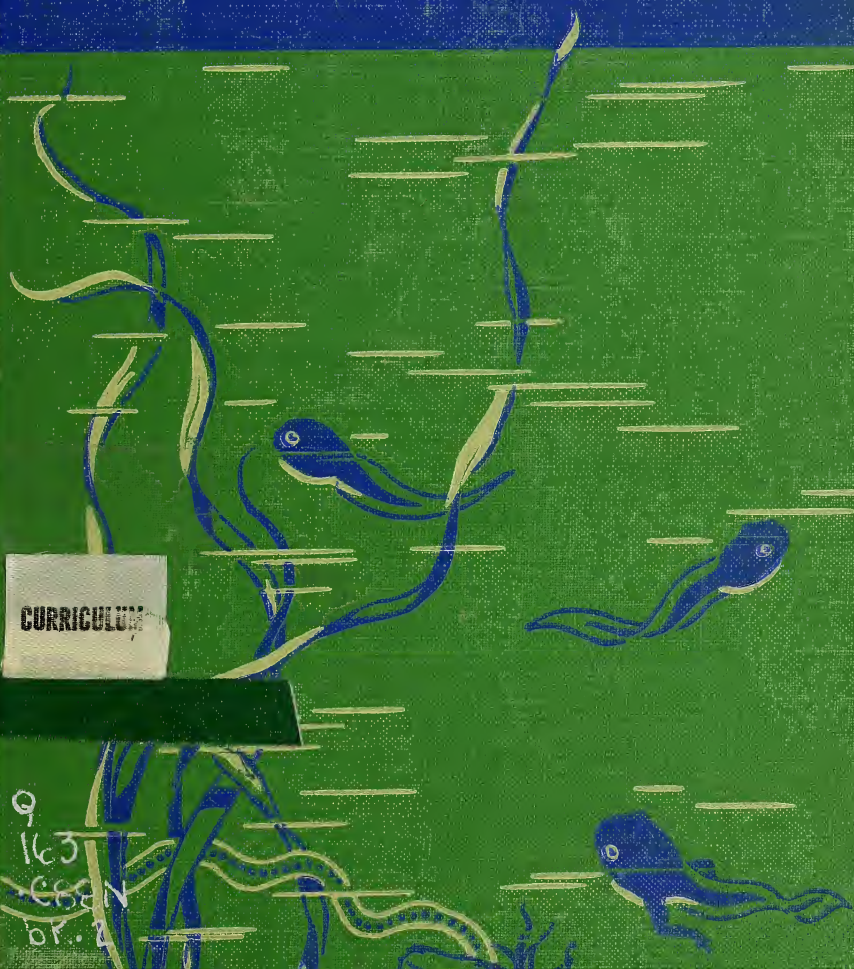


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Changes All Around Us

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From Sun to Earth
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The Earth Then and Now
CRAIG · JOHNSON · LEWIS

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Changes All Around Us





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I

All Kinds of Weather

OUR WEATHER NEEDS

RAIN

FOG

SNOW

ICE



Our Weather Needs

Mary and Bill were at the window.
They were watching the thunder storm.



O-o-o-o! O-o-o-o! O-o-o-o! went the wind. It blew dark clouds across the sky. It blew papers and leaves through the streets.

People ran to their houses. Birds flew to their nests in the trees. Other animals ran to find hiding places.

Flash, flash, came the lightning.

Boom, boom, rolled the thunder across the sky.

Splash, splash, down came the rain.

The wind blew and blew. It broke branches from the trees. It pushed everything that was in its way.

"What a hard storm!" the children said. "This will be bad for many people."

"The flowers in the gardens will be broken," said Bill.

"It will blow down the corn and other food plants," said Mary.

The children were right. The wind does many things that are bad for people.



Sometimes it blows down fences. Sometimes it blows down chicken houses and other small buildings. Once in a while it blows a roof from a barn or a house.

But the wind does many things that help people, too. It brings the storm clouds. But it blows them away again. It brings dust and dirt. But it takes dust and dirt away too. The wind helps to dry wet streets. It helps to dry many of the wet places out of doors.

The wind helps to plant seeds too. Dandelion seeds, seeds from some trees, and many other seeds blow about in the wind. When they stop moving, many of them fall into good places to grow.

The wind does much that is good for things living on the earth. It does much that is bad for things living on the earth. Can you think of some of these things?

Mary, Bill, and the other children watched the storm. By and by the flash of the lightning and the boom of the thunder stopped. The wind stopped too.

But the rain fell on and on. Out of doors everything was very wet.

"I wish the rain would stop falling," said Mary.

Miss Gordon said, "We need the rain. We have had no rain for a long time."

"The farmers need rainy days," said Bill. "They need rain to make their food plants grow."



Bob said, "The rain gives us water to drink and to wash in. We must have rain to fill the reservoirs. Reservoirs hold the water that city people use."

"We must have much rain to fill wells and springs," said Rachel. "Most people who live on farms get their water from wells and springs."

Miss Gordon said, "Yes, and much rain is needed to keep water in the rivers and lakes."

Bob said, "But if it rains all the time, there will be too much water. Sometimes rivers, lakes, and reservoirs get too full of water. Then we have floods."

"Yes, that is so," said Miss Gordon. "Sometimes there is so much rain that the little new plants are washed out of the ground."

"Sometimes the older plants become soft and do not grow."

"Floods are very bad," said Mary. "Sometimes farm animals are lost in the flood."

"Yes," said Rachel, "sometimes floods run into towns and cities. The streets are full of water. The water goes into the houses. Many times people have had hard work to save their homes and their lives."



“But you can have too much sunny weather, too,” said Bill. “Sometimes it does not rain for so long that food plants dry up.”

Rachel said, “The farmers have a hard time in dry weather, too. Sometimes the water in the wells dries up. Then the farmers and their families do not have good water to drink. The cows, horses, and pigs do not have good water to drink.”

Miss Gordon said, " We need all kinds of weather. But too much of any kind of weather is not good."

Miss Gordon was right. We need all kinds of weather. And there are many, many kinds.

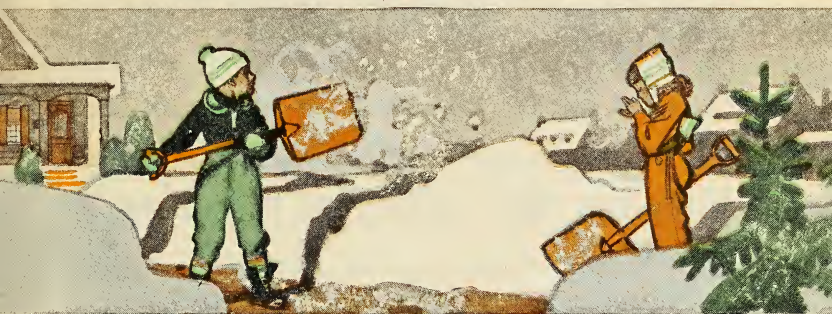
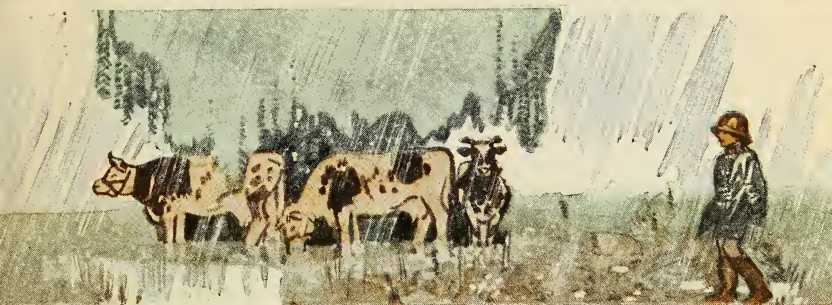
Some days are so cold that we need to wear our warmest clothes.

Some days are so hot that we wear almost no clothes at all.

Some hot days are wet and rainy. Some hot days are sunny and dry. Other hot days are sunny, but the air feels wet. On these days people feel very warm and uncomfortable.

Some cold days are dry and sunny. Other cold days are wet with snow or rain. On cold, wet days people feel very cold and uncomfortable.

The earth has all kinds of weather.



Rain

Do you like to watch the rain come down? Do you like the sound of the rain? Do you like to see the drops come falling through the air?

Sometimes the drops are so small that we can hardly see them. But they make the grass, trees, and flower gardens very wet. We know it is raining hard, for we can feel it on our hands and faces.

Sometimes the rain comes down in great big drops. At first you can see the big wet spots which they make on the walk. Soon the big drops come down thick and fast! How wet everything is then!

Sometimes the rain comes down so fast that you cannot see the drops at all.

Everyone knows that rain comes from the clouds. How dark the clouds are when the rain comes thick and fast!



But sometimes little rain falls when dark clouds are in the sky. Then the wind blows the clouds away where you cannot see them.

Watch the rain as it falls. Look up high and see the drops come down, down, down. Much rain is needed to water the earth.



Fog

One morning there was a fog. The children were on their way to school. The air was not sunny and bright.

The children could see only a little way down the street. They could not see the school building until they were very near it.

"The fog is very wet," said Mary.
"My face feels wet. It isn't raining, so it must be the fog."

"The walks are wet," said Bill.

"I wonder if the trees are wet," said Bob.

He put his hand on a tree. The tree was wet. Everything was wet and sticky.

"What is fog?" Mary asked. "Is it smoke?"

"No, it isn't smoke," said Bill. "It looks like smoke, but nothing is burning."

"Well, what is it, then?" Mary asked again.

Jane said, "I know what fog is. Fog is a cloud. That is why everything in it feels so wet and sticky."

"How could fog be a cloud?" asked Bill. "Clouds are up in the sky."

When they were in the schoolroom, the children asked Miss Gordon about fog.

She said, "Jane is right. Fog is a cloud. It is a cloud which is made right here around us. It is the same as the clouds which are high in the sky."

People must watch very carefully when they are out in a fog. It is not easy to see automobiles in a fog. People must be careful when they go across the street. They must be careful when they walk along country roads.

Boats, too, must be very careful in a fog. They might run into each other. The fog horns blow and blow. They seem to say, "My boat is here.

Don't come too near."

Why do you think people should drive their automobiles very carefully in a fog ?

Why do trains run slowly in a fog ?

Airplanes, too, must be very careful in a fog. Many times they do not leave the ground when there is a fog.



Snow

Snowy days are great fun. Snowy days are useful too.

The snow makes a covering to keep the plants warm in winter. Many plants freeze in winter when the snow does not cover them. We say that they are winter-killed.

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The snow makes a warm covering for the earth. Did you ever have anyone cover you with new soft white snow for a minute ?

Were you warm under your cover of soft white snow ?

Was it warmer under the snow than it was in the outside air ?

Some animals keep warm in the snow. They hide away from the wind. They rest near the ground. They let the snow fall over them.

Many times they sleep while the snow covers them. They are comfortable and warm in their snowy beds.

Snow has other uses too. When snow melts, the water runs into the ground. The ground needs this water. It helps to give the trees, grass, and other plants the water they need.

Lakes and rivers, too, need the melting snow. It helps to fill them with water.

Ice

The children put a dish of water out of doors by the window. They wanted to see what happens to water while it is freezing. This is what happened.

At first the ice on top of the water was as thin as paper. It was so thin that it broke when the children put their fingers on it. Slowly the ice grew thicker. It always stayed at the top of the water. The water at the bottom of the dish was the last of all to freeze.

Ice always forms at the top of water. Ice is lighter than water. That is why we always find it at the top, first of all.

Put some pieces of ice in a dish of water. In what part of the water do the pieces of ice stay? Move them about. Do they drop to the bottom? Push them down to the bottom of the dish. Do they stay there?



Miss Gordon asked the children, "Do you think the top of the water is the best place for the ice to form?"

The boys and girls thought about this question for a while.

Then Bob said, "Yes, I do. If the ice did not form at the top of the water, we could not go ice skating. We could not skate at the bottom of the lake very well."

Mary said, "I think the top is the best place for ice to form. Sometimes in the winter time people have to go across the ice. Horses pull big sleds. Then people can ride over the ice."

Miss Gordon said, "Yes, those are both good answers. But you have not thought of the best answer. See if you can find out what it is."

The children thought and thought. They looked at books on the reading table.

After a while Mary found a picture of a man fishing through a hole in the ice. She showed the picture to Rachel. She said, "The fish must live in water under the ice."

Then Mary and Rachel asked Miss Gordon if rivers and lakes ever freeze all the way to the bottom.

Miss Gordon said, "Not very often. Almost always some water is left at the bottom where the fish can stay."

ice forms at the top of water



Bill said, "Frogs and turtles go into the mud in winter. They are safe from the cold. But they might freeze if the ice lay next to them at the bottom of the water."

The children said, "The water animals are much better off with the ice at the top of the water."

“That was my best answer,” said Miss Gordon. “The water animals must have a place to live in winter. They must have room to live under the ice.”

THINGS TO THINK ABOUT

There are many kinds of weather on the earth. We need them all. We need sunny weather, and we need rainy weather. We need the wind, the snow, and the ice. We need hot wet weather and hot dry weather.

Just enough of each kind of weather keeps plants, people, and other animals living on the earth. Too much of any kind of weather makes living very hard.

Try to think of long weeks when the sun shines and there is no rain.

Try to think of thunder and lightning, rains and floods.

Try to think of long weeks of ice, snow, and cold wind.

When you think of times like these, do you ever wonder how plants and animals can go on living on the earth?

Of course many plants and animals do not keep on living when bad weather comes. But the world is full of plants and animals that go on living through all kinds of weather.

THINGS TO DO

1. Tell how a snow storm is different from a rain storm.

What can you hear in a rain storm?

What can you hear in a snow storm?

Tell how each storm looks.

Tell how the world looks when each storm is over.

2. Make a picture of a windy rainy day. How can you show that the wind is blowing? How will people hold their umbrellas? How will they be dressed?

3. Make a picture of a snowy day. Of course the ground will be covered with snow. What other places will be covered with snow?

4. Let some snowflakes fall on a piece of dark paper. See how beautiful they are. Can you find two that are just the same?

5. Make a picture of a snowflake. Make it large enough so that all the children can see every part of it.

6. Some day when it is raining try this.

Take a flat dish. Cover the bottom of the dish with flour.

Put on your rain coat and rubbers.

Take your dish of flour out of doors. Put it on the ground. Let the rain drops fall into it for a little while.

Take the dish of flour into the house. Look at the spots which the rain drops left in the flour.

Are some of the spots larger than others? Are some of the spots deeper than the others?

Can you tell why the spots do not all look alike?

7. Ice and water are different in many ways. Tell as many of these ways as you can.

What can you do with water that you cannot do with ice?

What can you do with ice that you cannot do with water?

II

How Living Things Stay Alive through the Year

CHANGES OUT OF DOORS

HOW PLANTS LIVE THROUGH THE WINTER

FOOD FROM PLANTS

**HOW SOME ANIMALS GET READY FOR
WINTER**

**HOW OTHER ANIMALS LIVE THROUGH
WINTER**

HOW PEOPLE GET READY FOR WINTER



Changes Out of Doors

Plants, people, and other animals keep on living through all kinds of changes. They live through cold winter and hot summer. They live through wet times and dry times. They live through storms and through still, sunny weather.

People find many ways to live through changes in weather. When storms blow down their buildings, they build new ones. They try to make their new buildings stronger than the old ones had been.



When storms break down their food plants, people try to plant new gardens. They carry away branches of trees and other things that have been broken by the storm.

People are always trying to find new and better ways to help themselves when bad weather comes.

When the bad weather is over, plants begin to grow again. New leaves and branches begin to show. Roots go far into the ground.

Animals which have lost their homes begin to make new ones. They look for new places to find food.

One of the greatest changes for all living things is the change from summer to winter. Can you think of changes in your way of living when summer turns to winter? Can you keep warm? Have you a warm house in which to live? Can you get food?

Suppose you were a frog. What should you do in the fall? Then the days are growing shorter. The nights are longer and colder. Some night the top of the water might turn to ice.

A frog eats insects. But on a freezing fall morning a frog cannot find any insects to eat.

What should you do if you were a frog in the fall?

Suppose you were a tree or a grass plant. How should you find water in winter? Where should you get food to keep you alive?

There are many different ways in which plants and animals live through winter's changes.

People have found some ways that other animals cannot use. People can think and plan for winter. They plan many, many ways to make winter an easy time in which to live.



Plants and animals have many ways to help them live through the winter. But they cannot think and plan as people do.

THINGS TO DO

1. Draw a picture of the out of doors in fall. Have some trees and bushes in your picture. What colors shall you use for the leaves? Put some grass and flowers in your picture. Put some children in the picture. How will they be dressed?

2. Make another picture. Show how things in the first picture would look in winter.

3. Make another picture. Show how things in the first picture would look in spring.

4. Put some animals in each of your pictures. Can you have the same animals in each picture? Which picture should have the most animals in it? Why?





How Plants Live through the Winter

PLANTS STORE AWAY FOOD

Plants are living things. They must have food to keep them alive.

Most plants have enough food to keep them alive in winter. They have food which has been stored away.

Where should you look to find the food which has been stored away in plants ?

There are three places for plants to store their food. Some plants store part of their food in their roots. Some plants store part of their food in their stems. Some plants store a little of their food in their buds.

The food that they store keeps them alive through the winter.

DO YOU KNOW THE PARTS OF A PLANT?

Do you know —

Which part is the root ?

Which part is the stem ?

Which part is the leaf ?

Where the buds are ?

What the buds hold ?

Can you answer these questions ?

Do you want to know where plants store their food ?

Then you must know something about the parts of a plant.



Which Part Is the Root?

The roots of the plant are under the ground. The roots hold the plant in the ground.

Pull a plant up by the roots. Do you see the earth which is still sticking to the roots? These roots are like very fine hairs.

They wind around and around through the ground. They seem to tie the plant into the ground.

The roots take water from the ground for the plant. Plants must have water if they are to live.

Which Part Is the Stem?

The stem of the plant is the part where the leaves begin to grow.

There are many different kinds of stems.

There are hard, strong stems like the branches of a bush or a tree.

There are fine stems which are easily broken, like the stem of the dandelion.

There are fine stems which are not broken easily, like stems of grass.

There are long stems, like the stems of beans.

There are small fat stems. Can you find the stem of the lettuce plant? It is inside the head of lettuce. It is called the "heart."

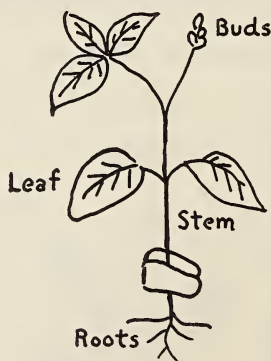


Which Part Is the Leaf?

The children in Miss Gordon's room planted some beans in a window box. The seeds grew into little plants. The plants had leaves. Then a flower bud came.

One day the children pulled a little bean plant out of the ground. They looked at the roots. They looked at the leaves and buds. They looked at the stem where the leaves and buds were growing.

Mary said she would like to draw a picture of the little plant. Here is the picture she made. Look at Mary's picture and see where the leaves and buds are.



What the Buds Hold

Some buds hold leaves. Some buds hold flowers. Some buds hold both leaves and flowers.

Winter buds on trees and bushes hold the first spring leaves and flowers.

WHERE PLANTS STORE THEIR FOOD

Root Storehouses

In the late fall and in winter the grass looks dry and dead. But under the ground the roots are still alive. They are holding food and water. When spring comes, new grass will come up through the ground from these roots.

Have you seen weeds growing by a fence or by the side of the road? How do they get there? Surely no one plants them. Many weeds grow from year to year because their roots stay alive under the ground.

In the winter the part of the plant above the ground is dry, brown, and dead. But the roots are not dead. They are holding food all through the winter.

In the spring new stems and leaves begin to grow. The plants use the food which has been stored in their roots all winter.

Carrots, beets, radishes, and turnips hold much plant food in their roots. They hold so much food that people like to eat them. Then the plant food becomes food for people.

THINGS TO DO

1. Did you ever hear of a vegetable garden in a dish?

Cut off a piece of a carrot or a beet or a turnip. Cut your piece from the top of the vegetable. Cut pieces from the tops of two or three vegetables.

Stand your vegetables in a flat dish. Keep a little water in the dish. Be sure to keep your dish in the sun.

By and by little new leaves will grow from the tops of the vegetables. They will be a light, pretty green. They will be smaller than the leaves which grew on the vegetables when they were in the ground.

Can you tell what makes these leaves grow from the vegetables when you keep them in water?

2. Try this when winter is almost here.

Find a place where the grass or weeds look dry and dead. Be sure that it is a safe place to dig.

Dig up a small piece of the soil. Do you see the roots of the grass and weeds in the soil?

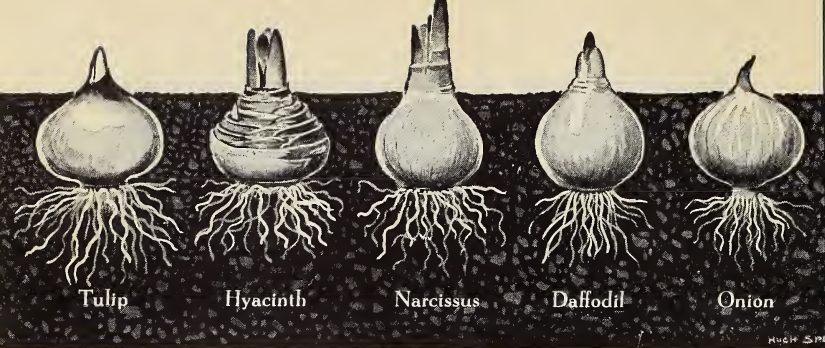
Take a piece of soil and roots as big as your two hands. Put it in a flat dish. Put it in a sunny window. Water it every day.

Watch to see if the grass will begin to grow again.

3. Do you like to eat carrots, beets, or turnips? When you eat them, you know that much good food has been stored in these roots.

One large turnip will feed six people for a meal. Eight beets or eight carrots will feed four people. These plants store a great deal of food in their roots.

Can you name other vegetables that are root storehouses?



Stem Storehouses

Have you ever planted bulbs? Here are some pictures of bulbs. There are many different kinds.

Some children say, "Bulbs look like onions."

They are right, for an onion is a bulb.

Most bulbs must be planted in soil, but some bulbs will grow in water. Narcissus bulbs will grow in water.

Which do you think a bulb is — a stem or a root?

Some children say, "A bulb must be a root. You put it way into the ground when you plant it in soil."

This is not the right answer. A bulb is not a root. It is a stem. It is a round, hard, fat stem.

Look at an onion. Do you see the little strings, or fibers, on the under part? These are the roots. The large round part which we eat is the stem.

Perhaps you would like to plant some narcissus bulbs in water. Then you could see how the beautiful plant grows from the bulb.

Long strings, or fibers, will begin to grow from the under part of the bulb. These are the roots. The root fibers will take up water to make the plant grow. But they do not hold food for plants. The food is in the bulb, or stem.

As the roots grow from the under side of the bulb, green leaves push their way through the top of the bulb. The roots grow longer and longer. The leaves grow larger and larger.

A flower bud may grow out from the bulb. Its blossoms will be white and beautiful. It will have a sweet, sweet smell.

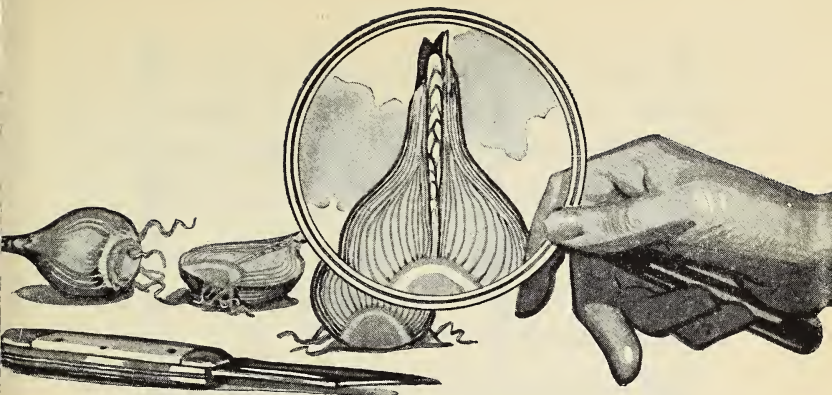
As the leaves, flowers, and roots grow larger, the bulb part of the plant will get soft and empty. When the bulb looks like this, feel it with your fingers. It will feel like a stem now.

Do you know what makes the bulb part grow soft and empty? The food has gone out of the fat, round, hard part. The plant has used this food to grow.

By and by the flowers will become dry. The leaves will soon turn brown.

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But by this time more food has been stored away in the bulb. In the heart of the bulb is a young plant which will need this food next year.

Cut a bulb in two as you see it in the picture on this page. Can you see the leaves beginning to grow in the heart of the bulb? Can you see the food which will be used for the plant to grow?

THINGS TO DO

You can plant narcissus bulbs in water.

1. Fill a dish with small stones. Stand the bulbs on top of the stones. Place them carefully so that they will not fall over.

Be sure that your bulbs are right side up. Do you see a round hard place on the bottom of the bulb? The roots will grow from this place. The other end will be a leaf. It will not be a root.

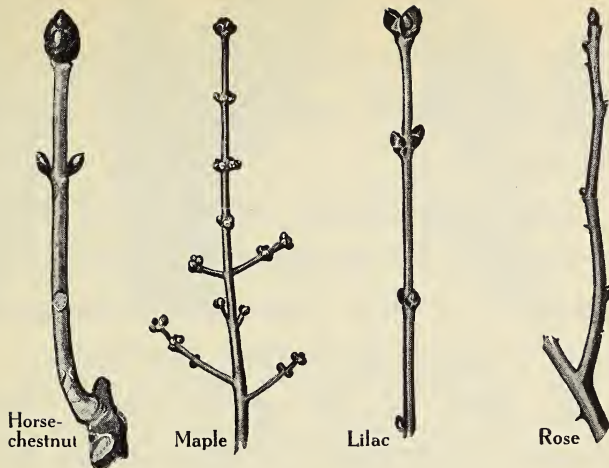
2. Put water into your dish. The water must just cover the stones. It must just cover the hard places on the bottom of the bulbs.

You must not cover your bulbs with water. Too much water makes them soft. The plants do not grow well when the bulbs are soft. Be sure to keep just enough water in your dish.

3. Put your bulbs in a dark place. Leave them in the dark place until they have long roots.

The roots wind themselves around the stones. They will hold the bulbs in the dish. Then the bulbs will not fall over when they have tall leaves and flowers.

4. When the roots are long and strong, put your bulbs in a sunny place. Soon you will have sweet, white blossoms on your narcissus bulbs.



Bud Storehouses

Trees are our largest kind of plants. Their tiny buds hold leaves and flowers. In the spring the leaves start growing. The leaves use the food stored by the tree.

Look at the twigs and branches of a tree in the winter. Can you count the hundreds of buds? Can you count all the buds which are on one branch?

There are many, many of these tiny buds on every tree in winter. So many buds can hold a great many leaves for a plant.

The leaves of bushes are stored in the buds too. Some buds hold tiny leaves and flowers.

Trees and bushes do most of their growing in the spring and in the early summer. At this time the buds grow larger. Leaves grow from the buds.

All parts of the plant grow. The branches and stems become larger and larger too. New twigs grow out on the branches.

Then come the long, hot, dusty days of late summer. The trees and bushes do little growing at this time. They begin to store away food for the cold days of next winter.

New buds begin to grow where the leaf grows from the branch. At first the bud is very tiny. You can hardly see it by the stem of the leaf. It grows and grows. In the fall the leaves drop off. Then you can see the new buds very easily.



Rutherford Platt

In the spring the buds become larger and larger. Soon the leaves show. When the leaves come out, the tree or bush begins to grow again. New twigs grow out on the branches. The branches grow larger.

The plant grows and grows until the late summer days come again. Then the plant stops using its food to make itself grow. It begins to grow leaf and flower buds again.

THINGS TO DO

1. With great care open a leaf bud to see the tiny leaf that is folded up inside. When you have looked at the little leaf, try to fold it up again as it was before. Can you do it?

2. Early in the spring, when the buds are tight shut, bring some branches inside and put them in a dish of water.

If you keep them in a warm, sunny place, the buds will open. You will like to watch the tightly folded buds open. You will like to see their pretty colors.

3. It is fun to watch the buds at different times of the year. Pick out a branch of a growing tree or bush. Tie something on it so that you will always know which is your branch. You must look at the same branch each time.

Look at the branch in the summer. See how tiny the buds are where the leaf grows from the branch.

Look at the buds in the fall, when the leaves are coming down. How much they have grown!

Watch them in the spring. How large they are! They are ready to open into leaves or flowers.

4. In the winter many trees and bushes look as if they were dead. They have no blossoms. They have no leaves. But most of them are not dead.

Take a walk to look at trees and bushes. Can you tell which ones are alive? The buds will tell you.

Food from Plants

LIVING THINGS NEED PLANTS FOR FOOD

What should we do without plants for food? Do you think that people and other animals could go on living without plants?

Perhaps you think you could go on living with just meat for food. But how could you get meat if there were no plants? Meat comes from animals. Those animals must have food from plants.

All living things must have the food which is found in plants. Even plants themselves live on food which they have stored away.

Our bread comes from plants. Fruits and vegetables are parts of plants. Name as many other kinds of food as you can which come from plants. How many, many, many kinds of food are found in plants!

WHAT PARTS OF PLANTS DO WE EAT?

One day Miss Gordon put up a sign.
This sign read,

WHAT PARTS OF PLANTS DO WE EAT?

Seeds Roots Stems

Leaves Flowers Buds

Write your answer on a piece of paper.

Some children wrote "seeds." Some children wrote "leaves." Some wrote "roots."

Then Miss Gordon and the children came together to talk about the sign.

"Which answer is right?" asked the children.

"All the answers are right," said Miss Gordon.

"We eat the seeds of some plants. We eat the leaves of other plants. We eat roots. We eat stems. We eat the flowers and buds of some plants."

"Let's name some seeds which we eat," said the children. "Let's name foods that come from each part of plants."

Miss Gordon wrote the names of these foods on the blackboard. In the pictures on the next two pages, you can read what Miss Gordon wrote.

"Yes, Miss Gordon is right," said the children. "We eat all parts of plants. We could not live without plants."

PLANT FOOD FOR ANIMALS

What are some of the plants that are food for animals?

You know that cows eat grass. What other plants do they eat?

Can you tell what plants are eaten by horses and sheep?

SEEDS
WHICH WE EAT

Beans Peas Corn

Flour is made from the seeds of wheat.

STEMS
WHICH WE EAT

Celery Potatoes Onions

Potatoes are stems which grow under the ground.

Onions are bulbs. Bulbs are stems.



ROOTS
WHICH WE EAT

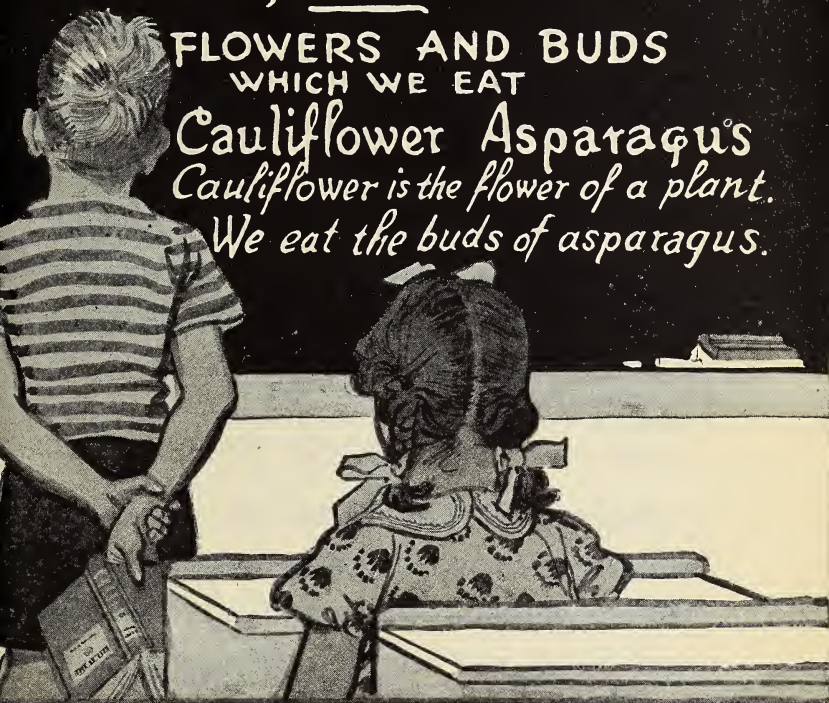
Carrots Radishes Beets Turnips

LEAVES
WHICH WE EAT

Lettuce Spinach Beet
Cabbage Dandelion

FLOWERS AND BUDS
WHICH WE EAT

Cauliflower Asparagus
*Cauliflower is the flower of a plant.
We eat the buds of asparagus.*



Do dogs and cats eat plants? Do you feed vegetables to your pet dog or cat? Your dog or your cat needs vegetables almost as much as you do.

Birds eat plant food. In the summer they eat berries and other fruit.

In the winter they eat the dry fruit which is left on trees and other plants. Birds eat many kinds of seeds. The birds of the world eat more seeds than you can think of.

Animals in woods and fields eat all kinds of plant food. Try to find out the plants which some of these animals eat — squirrels, muskrats, deer, rabbits.

WHEN ARE PLANTS READY TO BE EATEN?

Animals in the fields and woods eat plant foods just as they grow. They eat plants without cooking them. People sometimes cook food for their pets or for farm animals.

Animals seem to know which plant foods are best for them. Most animals do not eat plant foods which would hurt them.

People eat plant food in two ways. They eat some plants that are not cooked, just as other animals do.

But people cook most plant foods before they eat them. People think that foods taste better when they are cooked. They have found out that many plant foods are better for them when they are cooked.

People give much time to getting plants ready to eat. They think and plan about their food. They try to find out which plants are best for them. They grow these plants in their gardens.

They try to find the best ways to make these plants grow. They try to grow plants which will give the best kind of food for people.

How Some Animals Get Ready for Winter

WHAT WINTER MEANS TO ANIMALS

Do you think that other animals are as safe in the winter as people are?

People keep finding new ways to care for themselves. Each year better and better ways are found. Most animals have to go on in about the same way, year after year.

Their ways of taking care of themselves are good ways. If they were not, the animals could not live. Their ways do not change. What are some of the things which make it hard for animals to live in the cold winter time?

Getting food is one of the hardest things that animals have to do in winter. Most animals cannot find so much food in winter as they can in summer.

Some of it is covered with snow. Some of it is covered with ice after a freezing rain. Some of the insect food is hiding away in the bark of trees. Some of the animal food is under the ground.

How do animals find food in the winter ?

Each kind of animal has some way of taking care of itself.



HOW BIRDS LIVE IN WINTER

Many birds do not stay in the cold North through the winter. They fly to the South. In the South the air is warm. In the South there is more food for birds.

All through the fall the sky is a busy place. Many kinds of birds are flying to their winter homes in the South.

Over our heads hundreds of black birds go by together. Away go wrens, robins, and blue birds. Round and round through the air go the swallows. They look like hundreds of leaves falling from the trees.

Wild ducks and other water birds are seen in the sky on their long way to the South.

Many birds do stay in the North through the winter. There is not so much food for the birds in winter as there is in summer. But there are not so many birds to eat this food in winter.

The winter birds eat buds from trees and bushes. They eat dried berries which are still on bushes and other plants. They like dried fruits which have been left on the trees. They eat many kinds of seeds. Some birds like acorns and other nuts with soft shells.

Did you ever wonder how birds keep warm in the cold North? They often keep warm by puffing out their feathers. Have you ever seen a bird puffing out his warm coat of feathers and looking like a soft feather ball?

There are many places for birds to stay in winter. They sit in the branches of the evergreen trees. They hop into bushes. They hide in the long, dead grass.

Often the snow falls over them and gives them a warm cover. When the storm is over, they hop quickly out from their snowy beds. Then they look about for more food.

THINGS TO DO

It is often hard for birds to find food during the winter. Should you like to give them food? Here are some foods which winter birds like.

small pieces of bread

pieces of apple

cracked corn

oats or wheat

cooked meat

suet

meal worms

bird seed

nut meats

rolled oats

celery tops

sunflower seeds

Be sure to put your food where it will not blow away. Try to find a place which is out of the snow and rain. You might make a tray to put the food in.





HOW INSECTS LIVE THROUGH THE WINTER

Early in the fall the air is full of the sound of insects. Crickets sing, bees and flies buzz, katydids call.

Late in the fall and in the winter these sounds are still. You do not hear the katydids any more. You do not hear the crickets in the grass. You do not see bees and flies buzzing about. Where are the insects in winter?

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Some Insects Are in the Egg

Many insects die when winter comes. But before they die they lay eggs. Then there will be more insects of that kind in the spring.

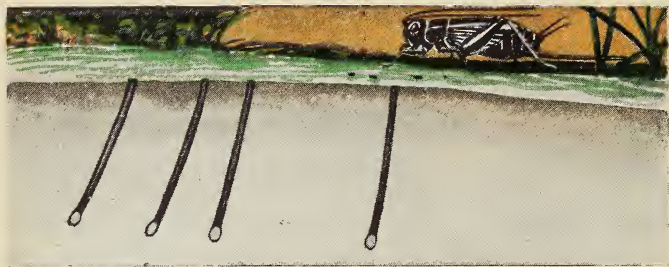
The eggs of insects do not need much care. Insects do not need to sit on their eggs as birds do. The eggs do not need to be kept very warm.

Most insects do not feed the little ones. The eggs are laid near food which the baby insects can eat. They begin to eat this food as soon as they are out of the egg. They eat it until they are large enough to find other food for themselves.

This food helps the baby insects to grow very fast. They can grow up without help from their parents.

Have you ever heard the happy song of the crickets ?

Crickets are shiny black insects. Some crickets are shiny green.



You can hear the song of the crickets in fields and gardens. They make their homes in the grass or under stones. We sometimes find green crickets in small bushes and trees.

In the fall the crickets lay their eggs in little holes. These holes are near the top of the ground. After the eggs are laid, most crickets die.

Crickets like many kinds of food. They eat grass, insects, vegetables, and fruits. They will even eat clothes.

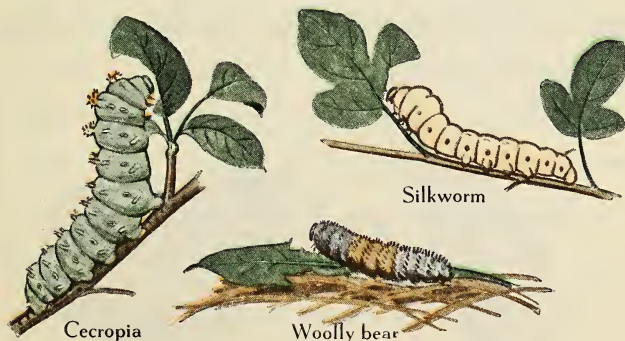
The little crickets come out of the eggs in July. It is not hard for them to get food. They will eat almost anything that they can find.

Some Insects Are in Cocoons during the Winter

Some insects change as they grow up. The full-grown insect does not look at all like the tiny thing which came out of the egg. These great changes take place in the lives of many moths and butterflies.

A caterpillar comes out of the egg. It eats and eats and grows and grows. It moves slowly about on its many short legs.

By and by the caterpillar stops moving about. It stops eating. It looks as if it were resting. The great change is about to take place.



Some caterpillars roll themselves up in something which looks like soft, very fine string. This comes from inside their bodies.

Some caterpillars pull two sides of a leaf together. They make their warm, soft coverings between the two sides of the leaf. These coverings are called cocoons.

There are many kinds of cocoons. Each kind of caterpillar has its own way of making its cocoon.

Some caterpillars do not roll up in soft coverings. The caterpillar hangs by one end from a leaf or branch. Slowly a hard covering forms around the insect. There the caterpillar, in its covering, hangs through the winter.

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Cecropia moth



Silk moth



Woolly bear moth



Cecropia
cocoon

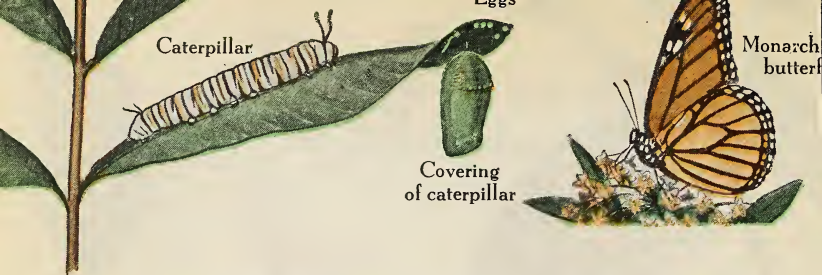
Many caterpillars make their cocoons on trees and bushes. Some caterpillars crawl into cracks in the bark of trees. Some crawl under stones.

The cocoons and the hard coverings help to take care of the caterpillars while their change is going on. This helps them to live through the winter.

In the spring a beautiful moth comes out of the cocoon. The slow caterpillar which made the cocoon now has wings.

The caterpillar with the hard covering is now a butterfly. With its bright-colored wings it can fly about.

What a great change this is !



Very soon the moths and butterflies lay eggs. These eggs are laid in gardens, on trees or bushes or other plants. The young caterpillars can eat the leaves of the plants when they come out of the egg.

Soon after the eggs are laid, most moths and butterflies die. The young caterpillars grow until fall. Then these too begin to change. And the story takes place all over again.

Some Insects Stay in the Ground All Winter

When the cold fall days come, most insects have a hard time to find food. Many insects take an easy way to get ready for winter. They crawl into the ground. They stay there until warm spring days come again.

Have you ever seen the pretty little potato beetle? He has black and orange lines on his wings, which cover his back. People who have potato plants in their garden do not like this little insect. The potato beetles would eat all the plants in the garden if they could.

In June and in August they lay their eggs. They lay them on the under side of the leaves of the potato plant. This is fine food for the new insects to eat.

The young insects do not look like their parents. They are red-orange and have no wings. After two or three weeks they crawl into the ground, where they stay for about two weeks.

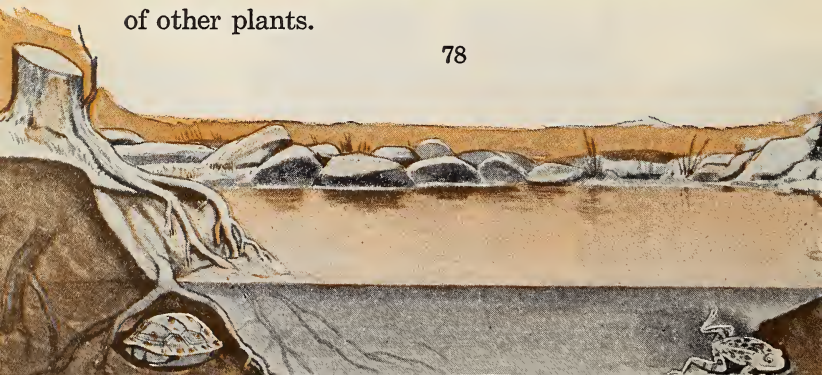


When they come out of the ground, they look like their parents. Now they too have wings with black and orange lines on them. If the farmer does not stop them, they will go on eating potato leaves until fall. When the plants die in the fall, this beetle crawls into the ground as its parents did the year before.

THINGS TO THINK ABOUT

If you bring katydids, crickets, or other insects to school, you must take good care of them. Do your best to make their home in school like the place where you found them.

Find out what to feed them. If they eat other insects, bring these insects for them to eat. If they eat leaves, bring leaves from the plant where you saw the insects feeding. They may not eat the leaves of other plants.



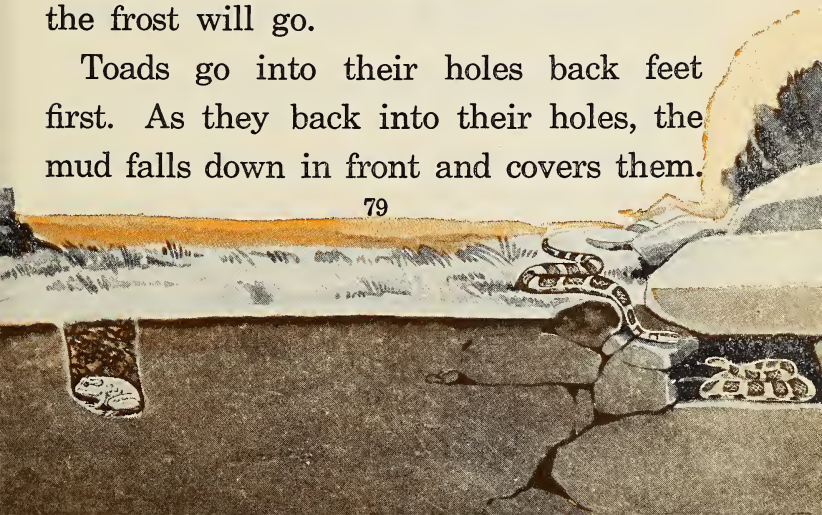
How Other Animals Live through the Winter

Turtles, toads, frogs, and many snakes have an easy way of living in winter. They do not try to find food at this time. They do not need to, for they are resting. They rest and rest through the cold of winter.

SOME ANIMALS STAY IN THE GROUND IN WINTER

Some of them crawl into the mud for their winter rest. Some of them dig holes. Their holes must be deeper than the frost will go.

Toads go into their holes back feet first. As they back into their holes, the mud falls down in front and covers them.





When spring comes, the sun warms the ground. The warm ground wakes up these resting animals. They come out to eat the food which is now ready for them.

SOME ANIMALS BUILD WINTER HOMES

Muskrats and beavers build beautiful houses, where they stay through the cold winter. Sometimes the muskrat builds his house in a swamp. Sometimes he builds it along the bank of a stream.

If the muskrat's house is in the bank of the stream, it is just a big hole or tunnel. If he builds in a swamp, his house is very fine. He makes a big pile of grass, stems, roots, and mud. The top of the pile is safely up out of the water.

Both kinds of houses have a tunnel going into the water. The muskrats can go down into the water for fish and water plants. There is a cozy room above the water where they can eat and sleep. Many muskrats live together. They can keep warm through freezing weather.

Sometimes they cannot go out to find food. Then they can eat the stems and roots of which their houses are made. Muskrats often store food in their houses. Sometimes they put away apples or potatoes.

Beavers' houses are much like the muskrats' houses, but they are larger and more carefully made.

Beavers and muskrats have a busy time in winter. At night they are very busy looking for food. Sometimes they find food in the water. Sometimes they look for it along the banks of the stream or in the swamp.

But the busy beavers and muskrats have a great deal of time to sleep. They sleep all through the day in their cozy houses. There they are safe from animals which like them for food. They are safe from snow and cold.

SOME ANIMALS TAKE LONG WINTER NAPS

Some animals, such as chipmunks, woodchucks, raccoons, badgers, and bears, take long winter naps.

The woodchuck goes to sleep in the fall. He sleeps on and on until spring. All winter long he sleeps away in his warm little house. You could not make a noise big enough to waken him.



If you could see a woodchuck in winter, you would think he was dead. Only warm days will wake him up. The warm spring sun makes him come out of his hole after his long winter's sleep.

The woodchuck has a very good home under the ground. There is a large room where he sleeps. This room has a tunnel going to the front door. It has many tunnels going to back doors. In the spring this room is used for the baby woodchucks.

Woodchucks, badgers, and raccoons live on their own fat during the winter. In the spring these animals are very, very thin.

Bears too are helped through the cold winter because they are fat. In the fall the mother bear looks for a hole in the rocks. She looks for some safe place where she can sleep. She stays there all winter. She has nothing but her fat to keep her from being hungry.

The father bear takes long winter naps. Sometimes he wakes up and comes out of his hiding place for a little while. He looks about for food. He eats a little bark or some nuts or a fish, but he soon goes back for another nap.

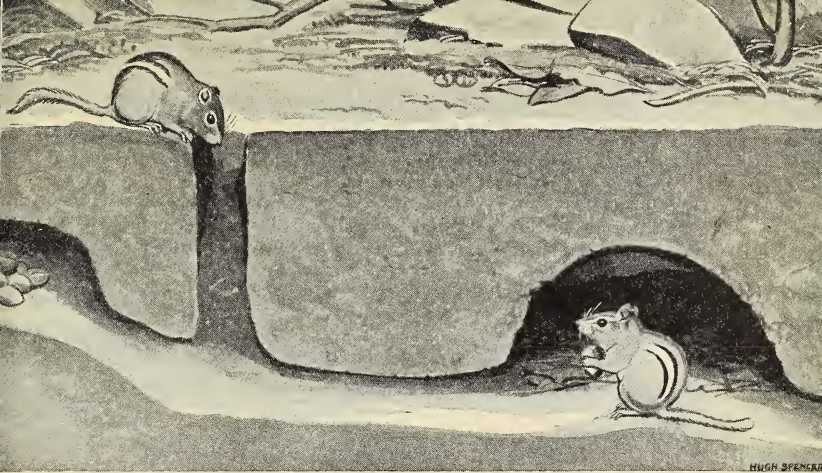
In the spring there is much food which bears like. They come out of their houses and eat and eat. They are ready for a good meal after the long winter of sleep.



Skunks do not make winter homes. Sometimes they find a warm spot under a barn. Sometimes they go into an old woodchuck hole. Sometimes they find a resting place under tree roots or by fallen trees.

They take long naps when it is very cold. They come out of their hiding places to get food when the days are warmer. They eat mice, seeds, or berries. They eat almost any small food they can find.





The chipmunk makes a very fine little house under the ground. He has long tunnels too. He has two rooms. One room is used for a sleeping room. The other room is for the food he needs in the winter.

The chipmunk does not sleep all winter as the woodchuck does. He takes long naps when the weather is very cold. But he wakes up when the days are warm. Then he has a big dinner. He eats the food he has brought into his little house.

SOME ANIMALS STORE AWAY FOOD FOR WINTER

Chipmunks are busy little animals. "Chip, chip, chip!" they say as they run about.

Through the fall days they are very, very busy. They work very hard getting food ready for winter. They look for nuts, acorns, pine cones, seeds, and berries.

Chipmunks have little pockets in their faces. These open into their mouths. The little chipmunks carry their food in these little pockets.

They often hide away their food under walks and trees. By and by they move it to their cozy little houses under the ground.

These good things will be ready for the hungry little chipmunks. They will eat them when they wake from their long winter naps.

Squirrels too are very busy in the fall days. They store away nuts, seeds, and grains for the winter. As they run about their faces are puffed out. The pockets in their faces are full of next winter's food.

They hide their food in trees. They hide it in the ground at the foot of trees. They hide it where they can find it on cold winter days.

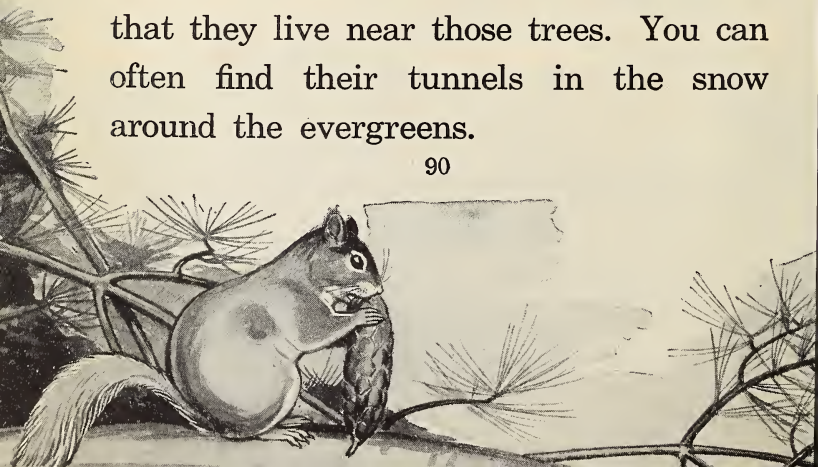
Squirrels too have long naps in the winter time. They roll up in some very funny places. They sleep in the top of people's houses. They often sleep in bird houses. They take naps under roots or in big holes in trees.



When the squirrels are not sleeping, they are very busy. They do not always use the food which they have put away so carefully. Sometimes they cannot find it. Sometimes another squirrel finds it and eats it. Sometimes they try to eat other food that is more easily found.

They find acorns. They eat seeds from weeds or bushes which stick out of the snow. They take the farmer's grain, fruits, and vegetables. They know how to use their teeth to get seeds out of pine cones.

Red squirrels like the cones of many evergreen trees. They like them so much that they live near those trees. You can often find their tunnels in the snow around the evergreens.



SOME ANIMALS LIVE IN ANY WAY THEY CAN IN WINTER

Some animals have little to help them when the cold winter comes. They do not make warm, safe houses. They do not store away food. They do not go to sleep for the winter. They walk or hop about to find food where they can. Their thick coat of winter fur keeps them warm.

Where do you think rabbits rest in the winter? They make resting places in a very easy way. They just sit down in a place that looks safe. This place must be out of the wind. It must be safe from larger animals.

A rabbit's resting place often is near a large stone or a fallen tree. Sometimes it is in the corner of a fence. It may be under a low bush or tree.

Snowflakes often cover rabbits in their resting places, but the snow does not hurt them.



When their nap is over, they climb out of their snowy nests to look for food. They eat the dry grass, the winter buds, and the bark of trees. They sometimes kill the farmers' young trees by eating the bark.

Rabbits have many enemies in winter. Many animals would like to have them for food if they could. But rabbits are careful to keep away from their enemies.

Often rabbits can see all around from their open resting places. When they are covered with snow their enemies cannot see them easily.

In cold places some rabbits change in color. Their fur turns white like the snow. Then their enemies have a very hard time to find them.

Deer do not make homes as beavers and muskrats do. They do not store away food to eat in winter as chipmunks and squirrels do.

They walk about the woods and fields and find many kinds of food to eat.

They like to eat the small branches of trees and bushes. They eat the bark of trees. They eat the moss which grows over the ground and around the roots of trees. They push away the snow with their feet. Sometimes they find grass under the snow. They find green twigs, ground pine, and other small plants.



Deer have many ways of living in the snow. Some deer make paths through the woods. Walking in these paths they can find bushes, trees, or moss. When there is a snow storm, they keep walking up and down the paths. The paths do not get full of snow when the deer do this.

Other deer push away the snow to make a round place like a floor. They push it away with their feet. Then the grass and mosses are ready for them to eat.

Wolves do not put away food for winter. They run about together killing other animals for food. They are so strong that they can kill and eat many animals.

Wolves will eat mice, rabbits, squirrels, deer, cows, and many other animals. When they cannot get meat, they will dig up some kinds of roots for food.

THINGS TO THINK ABOUT

Do you think that one of the animals we have been telling about takes better care of himself than the rest do? Does the chipmunk take better care of himself than the deer does? Does the muskrat take better care of himself than the turtle? Does the raccoon take better care of himself than the rabbit?

A chipmunk cannot run about through the snowy woods. He cannot push away snow to find food.

A deer cannot live all winter in a tunnel under the ground.

Wolves cannot build themselves a cozy house of grass, stems, and roots.

Each animal cares for himself in a way that is best for him.

How People Get Ready for Winter

WARM CLOTHES

What Clothes Shall We Wear?

Do you like to draw pictures? Here is something that you will like to do if you live where the winters are cold. Draw a summer picture and a winter picture.

Draw two things in the summer picture to show that it is summer. Flowers make a picture look like summer. What more can you draw to make the picture look like summer?

Draw two things in the winter picture to show that it is winter. How should the trees look? What more can you draw to make the picture look like winter?

Now draw yourself in each picture. How shall you be dressed in the summer picture? How shall you be dressed in the winter picture?



Name the clothes which you wear in winter that you do not wear in summer.

Name the clothes which you wear in summer that you do not wear in winter.

Have some one write these names where you can see them. How much you need to wear in winter ! How little you need to wear in summer !

Why We Wear Warm Clothes

Do you know why we need to wear warm clothes in winter ? Woolen clothes help to hold the heat in our bodies. Heat does not go through wool easily. We stay warm because the heat stays inside our woolen clothes.

Some people live where there is ice and snow almost all the year. They wear fur clothes. Their coats and hats and shoes are all made of fur. Fur is warmer than wool. Heat does not go out through it so easily as it goes through wool.

The babies in these cold places wear fur clothes. They wear underwear made of birds' skins. The soft feathers hold in the heat as well as fur does. These babies in their clothes of fur and feathers do not feel the cold winds.

Many people live in places which are very cold in winter. They must find some way to have warm clothes. If we wear warm clothes, we can be warm in freezing cold weather.



In summer we do not wear warm clothes. We wear clothes of cotton or linen. We do not want to hold the heat. The cotton or linen lets the heat get away from our bodies. Our bodies feel well when the heat can go out through our clothes.

Some places in the world have summer all the year. What kind of clothes do you think people wear in these warm places? Why do these clothes help the people to feel well?

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WARM HOUSES

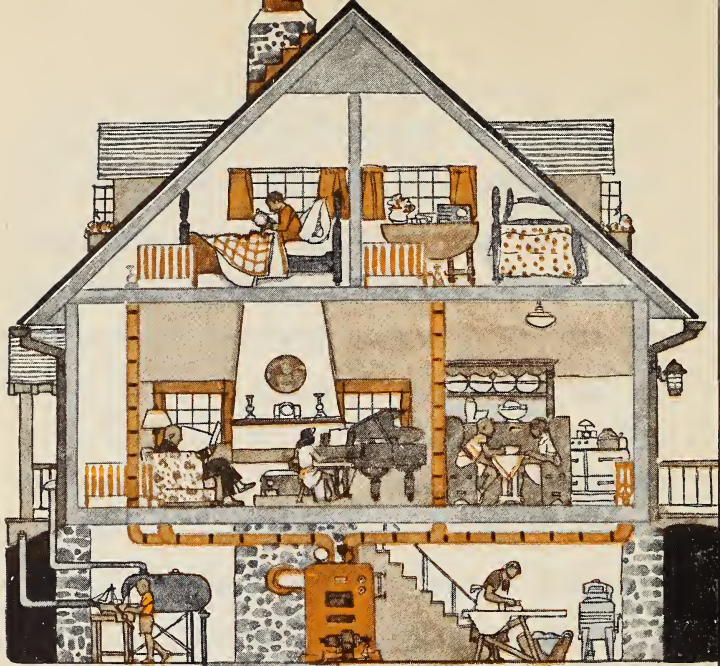
What Keeps Our Houses Warm?

In the winter time people try very hard to keep their houses cozy and warm. Many houses are almost as warm in the cold winter months as they are in July or August.

We do not need to wear our warm coats in the house. The heat in our houses keeps us warm without them. We must take off our coats and our hats when we come into the house. If we do not take them off, we are cold when we go out of doors.

Tell all you can about how your house is kept warm. Does your furnace burn coal or oil?

Ask your mother or father to tell you all about the furnace which heats your house. How does the heat go out of the furnace to the rooms above?



Does your house have steam heat? Where is the steam made? How is the steam carried to the rest of the house? Steam is very hot. It keeps a house cozy and warm.

Is your house heated by a stove? Then ask your mother or father to show you how the stove gives out heat and warms the house.

Much work has to be done to keep houses warm. Men work hard to get coal out of the ground. They stay under the ground all day. Day after day they work to get the coal out of the earth.

It takes a great deal of money to buy the coal or the oil which goes into your furnace. Some one has to work hard to get the money to keep your house warm.

Some people burn wood in their stoves or fireplaces. Cutting wood is very hard work too. Chop, chop, chop! Day after day the men chop down trees.

Then the wood must be sawed into pieces. The pieces must be cut small enough to go into a stove or fireplace. Great piles of wood are needed to last through the cold winter.

Some people plan for the winter. They buy their coal and oil or cut their wood long before winter comes. Then they are ready when cold weather is here.

FOOD FOR WINTER

Getting Ready for Winter

Jack and Helen lived on a farm. They liked the fall days because they could smell such good smells.

In the fall their mother canned many fruits and vegetables which the children liked to smell.

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"I like to smell peaches and pears cooking," said Helen.

"I like to smell the jelly," said Jack.

Their mother let them eat a little of the things she was making.

"I wish we could eat them all right now," said Jack.

"We must not eat all this good food now," said Mother. "We must save it until winter. The plums and pears and peaches will be gone from the trees. The berries will be gone from the bushes. We must save the canned fruit and jelly to eat in their places."

In the summer Jack and Helen had watched their mother can many kinds of fruit. Sometimes they helped her.

They helped their mother to dry corn and apples. They put them in a dry place and covered them with a clean cloth.

"The dust must not get on this good food," said Mrs. Stone.

Food from the Garden and Trees

Mr. Stone was Jack and Helen's father. He was a very busy man in the fall. He too had to get food ready for winter.

He brought in potatoes from the potato field. He brought in apples and grapes. He brought turnips, cabbages, and onions from the garden.

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"People who do not live on farms will buy some of these," said Mr. Stone. "We shall eat the rest in the winter."

Jack and Helen ate the jelly and canned fruit the next winter.

"Doesn't this taste good?" Jack often said.

Their mother said, "Boys and girls must have vegetables and fruits all the year round to be healthy."

Helen and Jack thought that fall is a very good time of year. Can you tell why? Do you think so, too?

How Do City People Get Food in Winter?

Mrs. Stone put away much food for the winter. Many people do not have time to do so much canning. They have no place to put so many cans of fruit and jelly. They have no place to keep the apples, potatoes, cabbages, and other vegetables.



Can you tell how these people have enough food in winter? Where is their food for winter?

Do you like to go to the store? Do you like to look at the cans of good food? Red cans, blue cans, green cans, yellow cans — all full of food. The store has canned fruit, canned vegetables, canned fish, canned meat — foods of every kind.

Do you like to look at the boxes of fruit and vegetables? Red apples, blue plums, yellow oranges, green lettuce, orange carrots, white cauliflower, red beets! Do you like to look at so much good food?

In the summer the city stores have many kinds of fruit and vegetables. In the winter they have almost as many kinds. We can buy lettuce, string beans, peas, and spinach. We can buy grapes, pears, or strawberries. We can buy nearly all the summer vegetables and fruits.

These vegetables and fruits will not keep all winter. They will not be good if they are kept many days. Do you know how stores can have so many different kinds of vegetables in winter?

In the winter, vegetables are growing in the gardens in the warm South. Fast trains bring the vegetables from these gardens to the cold cities in the North.



These trains have cars which are like big refrigerators. The refrigerator cars keep the vegetables fresh on their long ride.

When the trains get to the North, the cold air does not freeze the vegetables. The thick sides of the refrigerator cars keep the cold outside air away from the vegetables. The refrigerator cars are just cold enough to keep things good.

In a day or two these vegetables and fruits are in the stores of cities where the winter is cold. In another day or two people buy them. Soon they have eaten them all up.



Years ago trains did not run so fast as they do now. They had no refrigerator cars. Vegetables could not be brought from the gardens in the South. People had only the vegetables which would keep all winter. They could not have grapes, pears, and strawberries in the winter.

How many ways there are to have good food in the winter time! In what way do your parents get the kind of food that you need in the winter?

Do you know of any other way by which people keep food for the winter?

THINGS TO DO

Would you like to make a picture book of many fruits and vegetables? Try to find pictures of peas, asparagus, cauliflower, celery, spinach, peaches, pears, strawberries, plums, and grapes.

Have a plan for your book. Have a place for all vegetables that are leaves. Have places for all the vegetables that are roots or stems or seeds. Find good places for your many kinds of fruits.

THINGS TO THINK ABOUT

Do you think you could take care of yourself in the winter without help from anyone? Suppose you were a squirrel or a rabbit. You would have to take care of yourself, wouldn't you? You would have to find your own food. You would have to make your own house to keep you safe from storms. You would have only your fur to keep you warm.

But you are not a rabbit. You are a boy or girl. Do you think you could find your winter food? Could you build your house and make your clothes?

People think and plan about getting ready for winter. People help one another. A great many people are needed to help us get ready for winter.

III

How Living Things Use Air

**AIR IS ALWAYS AROUND US
KNOWING HOW WARM IT IS**



Air Is Always around Us

AIR IS EVERYWHERE ON THE EARTH

You know that plants, people, and other animals must have food and water. You know that people and other animals must have ways to keep warm in winter.

Living things need one more thing to keep them alive. They must have air.

Can you think of a place in the world that does not have air? Air is all about us. We cannot go away from the air.



There is air everywhere around us. Our schoolrooms are full of air. Air is in our homes. Air is everywhere in the out of doors.

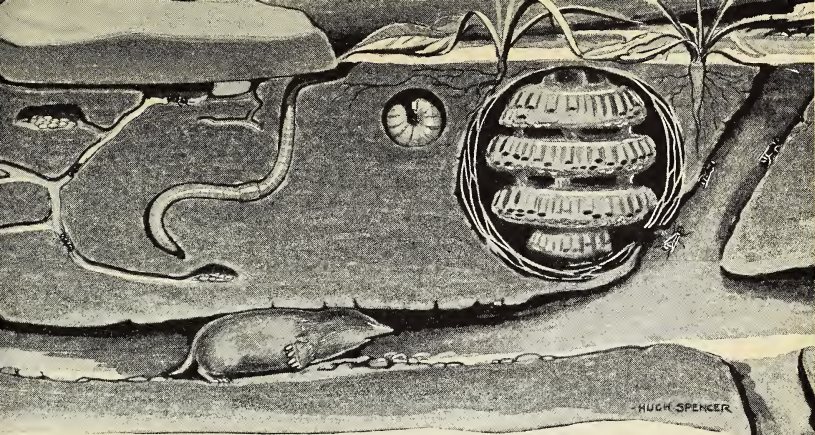
Air is around us at all times. We must have air in winter and in summer. We need air in spring and in fall. We need air if the weather is hot or cold. If it is rainy or dry, we must have air.

Air is around us all night and all day. We could not live without air.

We must have air to breathe. Hold your handkerchief over your nose and mouth for a very little while. Can you breathe well ?

Now hold your handkerchief so that you cannot breathe at all. How does this make you feel ?

Do you know why you do not feel well when you cannot breathe ? It is because air is taken away from you. You must have air to breathe.



Air is in the ground. Many animals live in the ground. Can you name some of them? These animals must have air to breathe. They breathe the air that is in the ground.

Air is in the water. Fish live in water. Tadpoles and other animals live in water. Some plants live in water, too. Animals and plants must have air. Most of these use the air that is in the water.

Everything that lives must have air. Where things are alive, there always is air.

WATER IN THE AIR

One day Bill said, "What do you think air is made of?"

Rachel said, "Well, I don't know what air is made of. But I know two things which always are in the air."

"What two things are always in the air?" asked the children.

Rachel answered, "My mother said that water and dust are always in the air."

Miss Gordon said, "That is right. Think about the day we made apple sauce in school. How very carefully we had to watch it! The water boiled away. We had to put more water in the dish of apple sauce."

"Yes," said the children, "we had to watch the apple sauce to keep it from burning."

"Where did the water go?" asked Miss Gordon.

"Into the air," said the children.

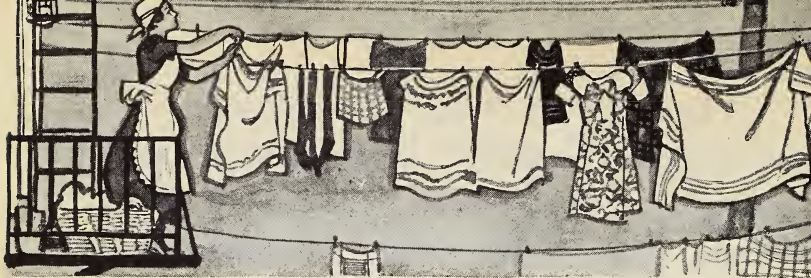
"Did you see it?" asked Miss Gordon.

"No, I didn't see it," said Rachel.

"But only a little water was left when the apple sauce stopped boiling. The rest of the water must have gone somewhere. It must have gone into the air."

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"You did see some of the water that went into the air," said Miss Gordon. "Think of the puffy little cloud which stayed near the dish. That cloud was the steam which had turned back into water. It stayed as water for a minute. Then it went away into the air."

Rachel said, "When you hang up wet clothes, the water goes from them into the air."

"Yes," said Miss Gordon, "and water goes into the air from many other places too."

The children told about many other things which give water to the air.

"When the wet streets dry, the water goes into the air," said Bill.

“Early in the morning the grass often is very wet,” said Mary. “It soon gets dry. The water that is on the grass goes into the air.”

Many other things send water into the air.

Your breath sends water into the air. Breathe hard on a cold window. Can you see the little drops of water?

Wet your hand. Hold it flat against the blackboard for a minute. Hold your fingers far apart. Then take your hand away. Does your hand leave a wet spot on the blackboard? Watch the wet spot for a little while. Where does it go?





Take two dishes. Put one cup of water in each. Cover one dish. Leave the other dish without a cover. Look at the dishes of water each day. In two or three days the water in one dish will be gone. In which dish does the water stay longer? Why?

DUST IN THE AIR

Do you know why a house needs to be dusted every day? Does some one come around at night and throw dust over chairs and tables and books?

The Brown family had been away all summer. When they came home, the house needed to be cleaned. Dust was everywhere! The children could write their names in the dust on the tables.

"How did the house get so dusty? No one has lived here all summer," Mary said.

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Mrs. Brown said, "We find that dust is everywhere. You can't keep dust out of most places. To keep dust away, you must cover things so that air cannot get to them. Dust is in the air."

Mrs. Brown was right. Did you ever look for something in a box which had not been opened for a long time? Did you find dust on the things in the box? How do you think the dust got into the box? The cover had been on the box for a long, long time.

Air was in the box. Everywhere that air goes, the dust goes too.

Dust is in the air. In dry weather it covers everything out of doors.

Trees, flowers, bushes, and grass get very dusty sometimes. Their leaves are covered with dust. They are not so green and pretty as they were. They grow very dry. They need to be washed with rain.



Mr. and Mrs. Brown and Mary were standing on a high hill. They wanted to see the hills, grass, and trees. They wanted to see the city far away.

"On some days we can see the city," said Mr. Brown. "But we cannot see the city today."

"Why not?" asked Mary.

"There is too much dust in the air today," her father said.



“There is a great deal of water in the air, too,” said Mrs. Brown. “I think it will rain before morning.”

That night the rain fell hard. The next day was bright and sunny. The rain had washed much dust out of the air.

How green the trees and grass were! What bright colors the flowers showed! Mary could see cows and fences on the hills. She could not see them before the rain. Now she could see the city far away.

Dust in the Air We Breathe

Think of the dust that is in the air around us. How can we breathe this air? Why does it not make us cough and sneeze?

A little dust in the air will not hurt us. Our noses help to take care of the dust that is in good air.

Do you know what your nose is like inside? Hold a small looking glass very near your face. Hold it so that you can look into your nose.

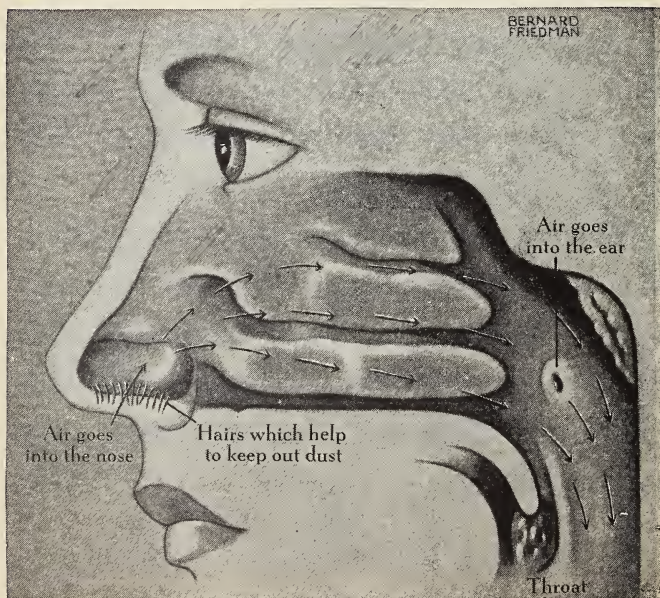
Do you see many tiny hairs in your nose? You need those hairs very much. They help you when you breathe. This is how they help you.

First the air goes into your nose. Then these little hairs catch some of the dust that is in the air. They keep this dust from going into your lungs. The air which goes into your lungs is then easy to breathe.

When you breathe, you do two things. You breathe air in and you breathe air out. Some of the dust goes back into the air when you breathe out. Some of it leaves your nose when you use your handkerchief.

At the bottom of the page is a picture of the inside of your nose. Do you see the hairs which help to keep out the dust? Can you see where the air goes? It goes into your nose and down into your lungs.

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Some air has a great deal of dust in it. When there is too much dust, we cannot breathe well. The hairs in our noses cannot catch enough of the dust. Too much dust makes us cough and sneeze.

Sometimes the wind blows much dust into the air. Then people must cover up their faces so that they can breathe.

Some rooms are so dusty they make us cough and sneeze. It is not good for us to breathe the air of dusty rooms. The dust hurts the inside of our noses and lungs. This makes us catch cold more easily. We should try to keep dust out of all our rooms.

Our schoolrooms are cleaned for us, but children must do their best to keep the room clean. It is easy to keep a clean room clean. It is not easy to clean a dirty room.

What can you do to help to keep your schoolroom clean ?

Knowing How Warm It Is

WHEN TO WEAR WARM CLOTHES

It is hard to tell which kind of weather children like best. It is fun to come to school in the rain. You can wear a rain coat and rubbers. You can carry an umbrella. You can keep dry when you are dressed for rain. You will not care when the big drops fall all around you.

Children like snowy days too. What fun it is to play in the snow with your sleds! What fun it is to build snow houses and snow men! What fun to go ice skating! Children like cold weather when they are dressed warmly.

When you come to school on cold winter days, you wear a warm coat and a hat. Some children wear snow suits. You wear warm underwear. The cold winter winds do not hurt you.



One fall day looked very sunny and bright. The days had been very warm. But this day was cold. The sun was shining, but a cold wind was blowing.

Mary and Bill did not wear their coats to school. They had on their sweaters. When they came into school, they were very cold. When they went outside to play, they were very cold. They could not keep warm when they played.

“ Why didn’t you wear warm coats ? ” the other children asked them. “ Didn’t you know that it was too cold to wear just your sweaters ? Don’t you know how to take care of yourselves ? ”

“ Yes,” Bill said, “ but we didn’t want to take the time to go back.”

Did you ever do a thing like that ?

Bill and Mary had very bad colds and had to stay in bed. Their mother said they must stay at home so that they would not give the other children colds.

The children at school wrote letters to them. Bill and Mary answered their letters. They said, “ It is a good thing to take time to go back for your coat. It is better to take time than to have a cold.”

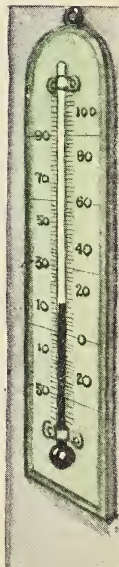
Their mother said, “ You should have taken time to come back. I could not tell you to put on warm coats. I did not know how cold it was. But you are big enough to take care of yourselves now.”

Then she gave them something to help them take care of themselves. She gave them a thermometer. The thermometer was placed on the outside of the house by the front door.

"Be sure to look at the thermometer every morning," said Mrs. Brown.

Then she told Mary and Bill what clothes to wear when the weather was very cold. She told them what clothes to wear when the weather was warm.

"Now," said Mrs. Brown, "you can take care of yourselves."



ABOUT THERMOMETERS

Can the thermometer tell you when to wear warm underwear? Can it tell you when to wear a heavy coat? Can it tell you when it is safe to wear a sweater?

Do you know how to use the numbers on the thermometer? The little spot like this ° is called a degree. When we see 68°, we read it this way: "68 degrees." When we see 32°, we read it this way: "32 degrees." When we see the number 0 we read it "zero."

Do you see the black line running up and down in the picture of the thermometer? In a real thermometer this line is sometimes red. Sometimes it is shiny. The number where this line ends shows how warm or how cold things are.

The line may end at 68°. This shows that the air is warm. The line may stop at 32°. This shows that the air is cold.

Here are some thermometer numbers which children should know.



90° Very hot: You can wear almost no clothes at all.

80° Very warm: Wear thin cotton or linen clothes.

70° Warm: A schoolroom should be 68°.

50° Cold: Wear a warm coat and a hat.

32° Very cold: Water will freeze. Wear a hat and a very warm woolen coat or a snow suit.

0° Zero! Very, very cold: Look out or Jack Frost will bite your nose! Wear the warmest clothes you have.

The larger numbers show us that the air is warm. The smaller numbers show us that the air is cold.

Looking to see where the red line ends is called "reading" the thermometer. Look at the red line in the thermometer. Heat makes this red line climb up and up. Cold makes the red line drop down.

Thermometers work the same way all over the world. Tell some of the places where you have seen thermometers.

Do you read the thermometer in your schoolroom? Does the red line stay in the same spot most of the time? Should the red line in an indoor thermometer keep climbing up and down? Why not?

Do you have a thermometer in your house? We need indoor thermometers almost as much as we need clothes. We want to be sure that our houses are warm enough. But we must be sure that they are not too warm.



Has the doctor ever put a thermometer into your mouth? The thermometer tells the doctor if you have a fever. If the shiny line in the thermometer climbs above 98.6° you have a fever. When you have a fever, you are sick, and you must go to bed.

THINGS TO THINK ABOUT

The air changes many, many times. Nothing changes much more than the air does.

The earth has warm and cold air. It has wet air and dry air. Warm air turns to cold air. Cold air turns to warm air. Wet air changes to dry air, and dry air changes to wet air.

Sometimes the air is almost still. Sometimes the air moves very fast. Moving air is wind. Sometimes still air is warm. Sometimes it is cold. Moving air or wind may be cold in winter and warm in summer.

We often say, "Nothing changes more than the weather." The weather changes because the air changes.

THINGS TO DO

1. Watch the thermometer. Read it in all kinds of weather. Can you understand what it tells you about the weather? Do you know what it means when the thermometer says 70°? when it says 68°? when it says zero?

2. Look at the thermometer every day at twelve o'clock and four o'clock. Does it always say what you think it will?

IV

The Sky above Us

THE SUN LIGHTS AND HEATS THE EARTH

ABOUT THE MOON

ABOUT THE STARS

WHAT IS THE SKY?

PLANTS AND ANIMALS NEED THE SUN

The Sun Lights and Heats the Earth

SUNLIGHT THROUGH THE DAY

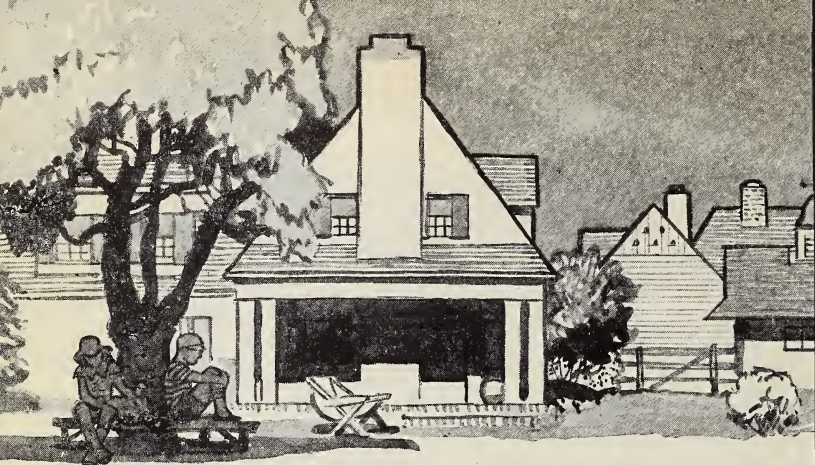
Lucy and Jane sleep in a room which has the first light of day. The sunlight comes through their window as soon as day is here. Lucy and Jane often wake up early enough to see the sun rise.

Did you ever see the sun rise? How did it look? Did the earth grow light all at once? How beautiful everything is!

You must wake up very, very early in the morning to see the sun rise. When the light of the sun begins to show, the earth begins to grow light. When the earth is light, day is here.







The sun is high over our heads at noon. Then it is very light. The lightest hours of the day come when the sun is high up in the sky.

Early afternoon is the warmest time of day. In summer the bright noon sunlight often makes you uncomfortable and very hot. You try to keep out of the bright noon sunlight. Noon shadows are very short. You must stay in the house or in the shade to keep out of the hot noon sunlight in summer.



Late in the afternoon the sun begins to go down. The shadows grow very long. There are many places in the shade where you can play.

But now you can play in the sunlight, too. It is not so hot as it was at noon. When the sun begins to go down, the day is not so bright. It is not so warm.

When the sun has set, day is done. Our part of the earth grows dark. In other parts of the earth people are having day, but we are having night.

Wherever the sun lights the earth, there is day. Wherever the sun does not light the earth, there is night. Without the sun we could not have day. Without the sun it would be night all the time.

SUNLIGHT THROUGH THE YEAR

Summer days have hours and hours of sunlight. Winter days have hours and hours of darkness.

When fall comes, the light part of the day grows shorter and shorter. When spring comes, the sunny part of the day grows longer and longer.

Can you play out of doors after supper in the fall? Why not?

In the spring can you play out of doors after supper?

In the summer evenings Lucy and Jane had a long play time. They could play out of doors until bed time. It stayed light for a long time. They went to bed at eight o'clock. Sometimes it was still light at eight o'clock.

In the fall evenings they could not play outside after supper. They had to play games in the house.

When their supper was over, darkness had come. Many stars were shining in the dark sky. Sometimes the moon was shining too. The electric street lights were shining. People had turned on the lights in their houses.

The morning light always wakened Lucy and Jane. In the summer time they wakened very, very early.

Their mother said, "When the sun comes in at the window, pull down the shade and try to go back to sleep. You do not get enough sleep when your day begins so early."

So in the early summer mornings Jane and Lucy pulled down their shade. Then the girls could go back to sleep.

In the fall the sun did not wake the children up so early. They had just enough time to wash, dress, eat their breakfast, and go to school.

In the fall the nights are very long. They are longer than the nights in the summer. The fall days are much shorter than the summer days. Each day is a little shorter than the day before. Each night is a little longer.

The sun itself gives us summer and winter. Long days of sunlight make the summer warm. Long nights of darkness make the winter a cold time of year.





THE EARTH'S BEST LIGHT

Mary and Bill stood looking at the night sky. Bright stars were shining. The round moon was shining too.

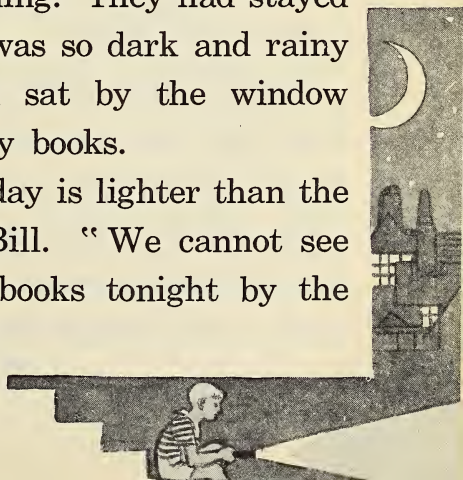
"How light the world is tonight!" said Mary.

"I can see the shadows of the trees," Bill said.

"Yes," said their mother, "many times the world is very bright at night. But there is always more light in the day time."

Bill and Mary thought of what they had done that morning. They had stayed indoors because it was so dark and rainy outside. They had sat by the window and read their story books.

"Even a cloudy day is lighter than the night time," said Bill. "We cannot see to read our story books tonight by the light of the moon."





The sun gives the earth most of its light. The sun is always shining on some part of the earth.

Clouds often come between us and the sun, but the sun goes on lighting the earth. Sometimes we see nothing but big dark clouds in the sky. But away above the clouds the sun keeps on shining. It never, never stops shining.

Have you ever watched a cloudy day turn into a sunny day?

Have you watched the clouds go out of the sky? As the clouds move away, the sun shines on the earth, as bright as bright can be. It has been shining all the time. If the sun did not shine, the earth would be as black as night.

THINGS TO DO

Here are some things you can do to show how bright the sunlight is.

1. Take a flashlight out of doors on a sunny day. Turn on the flashlight. Can you see its light? Does it make a bright spot on the walk or in the yard? Is the flashlight as bright as the sunlight?

2. Turn on the electric lights in a sunny room. Does the room seem lighter than it was before? Are the electric lights brighter than the sunlight?

You must watch your answers to both these questions. A day full of sunshine gives one answer to the question. A day without sunshine gives another answer. Can you tell why?

THE SUN HEATS THE EARTH

The sun heats the earth. Without the sun the earth would be freezing cold everywhere.

We could not live without the sun. The earth would be so cold that the plants would die. It would be so cold that the animals would die. People would freeze if the sun did not shine on the earth.

In the summer the sun makes a city street very hot. All day long it shines on buildings and streets. They grow very, very hot. Have the streets ever burned your feet on a hot summer day?

At the seashore the sunlight is very bright. Sometimes it makes the sand very hot. Has the hot sand ever burned your feet on a bright summer day? Have you ever had a bad sunburn on your face or on your arms and back?

How hot the sun must be to do all this!



The sun makes the earth warmer in summer than it does in winter. In the summer it is often too warm for you to play in the sun. You stay in the shade to be comfortable.

In the winter things are just the other way round. You often play in the sun so that you can keep warm. You are too cold when you play in the shade.



In some places the ground is very cold in winter. The winter sun does not make it warm. You must wear your snow suit and heavy shoes to keep your legs and feet warm. You wear them so that you will not take cold.

Do you know why the earth is warmer in summer than it is in winter? Here is one answer.

The days are longer in summer than they are in winter. There are more hours of sunlight to make the earth grow warm.

There are more hours for the sun to shine on the lakes and rivers and make them warm.

There are more hours for the sun to shine on the hills and fields and make them warm.

There are more hours for the air to get warm.

It is always warmer when the sun is shining. Day time is warmer than night. The sun heats the earth. Even in the winter the sun heats the earth. No one could live on the earth if the sun did not give it heat.

Mary and Bill live near two hills. In the winter the children have great fun playing on these hills with their sleds.

On one hill the sun shines nearly all day. On the other hill the sun shines only a little while in the afternoon. On one hill the snow melts very soon. On the other hill the snow lasts a long time.



Which hill keeps the snow longer — the hill in the sun or the hill in the shade ?

Now you can see that the sun does warm the earth. It warms it in winter as well as in summer.

This picture shows one of the places where the snow stays a long, long time. We find snow here after it has melted in most other places. Can you tell why this is so ? Can you name other places where the snow melts very slowly ?

Do you want to find a good place to play on a hot summer day? Then look for a large shadow. Shadows are not so warm as sunny places. They are not so warm because something keeps a part of the sunlight from that spot.

When the sun's light is not here, its heat is not here. The sun's light and heat go together. In places where there is most sunlight there is most heat. In places where there is little sunlight there is little heat.

Some countries have long cold winters. The snow comes early in the fall. Day after day the snow falls. It piles higher and higher. It stays on the ground until late in the spring.

In these places the winter nights are very long. The days are very short. Sometimes night begins at four o'clock in the afternoon. At eight o'clock in the morning it is still night.

Can you see why the snow stays so long? Very little sunlight comes to these countries in winter. They are very cold because they have so little sunlight.

In these countries stoves and fireplaces help to keep the houses warm. Some houses have furnaces. But many times the houses are very cold. People tell stories of things freezing in their houses. At night, water sometimes freezes in a dish which is almost on the stove.

Some countries are almost as warm in winter as they are in summer. These countries have much sunlight. In these places the day has many hours of sunlight. The winter nights are not long.

No place is made warm because the cold has been taken away. Places grow cold because the heat has been taken away. The heat is taken away because the sun's light is away.

THINGS TO DO

The sun heats the earth. Here are some things you can do to show that this is so.

1. Stand by the window in the sunshine. Then move to another part of the room. Which place is warmer?

This is true in winter and in summer. The sunny places are the warmer places. Sometimes the sunny places are very much warmer than places in the shade.

2. Put a thermometer in the sunny part of a room. Put another thermometer in a part of the room that is in the shade. What do thermometers tell us about the heat of the sun?

3. Put two thermometers out of doors on a hot summer day. Place one in the sun. Place the other in the shade.

Watch the red line in the thermometer that is in the sun. It may climb away up to the top of the thermometer. The one that is in the shade may show that the day is not very hot, after all.

You know that sunny places are warmer than places in the shade. But you do not know how very much warmer they are until you use a thermometer.

About the Moon

WHAT IS THE MOON?

Everyone likes to watch the bright moon shining down upon the earth at night. It is fun to watch it night after night. Did you ever try it?

Tell about some of the things you saw when you watched the moon.

As children watch the moon they think of many questions. "What is the moon?" is a question that children ask all over the world.

Can you answer that question?

Some stories say that the moon is a shiny silver dish in the sky. Some children think it is a bright light like an electric light.

These answers are not right. The moon is a real place, just as the earth is a real place.



The moon is a very, very big place. It is thousands of times larger than the biggest place you ever saw.

The moon is very large, but it is not so large as the earth. It would take many moons to make a place as large as the earth.

We know that the moon is a very large place, but it looks like a small, round, silver light in the sky. Some people say, "The moon looks as big as an orange." Other people say, "It looks as big as a large round dish."

Do you know why the great moon looks so small to people on the earth? It looks small because it is so very far away.

Anything looks small when it is far away. An airplane looks like a tiny spot when it is high in the air. But how large it is when it is on the ground! When you are on the top of a high building, the people on the ground look like dolls.



The moon is far, far away from the earth. It is far, far out in the sky. No airplane in the world could fly as far as the moon. It is thousands and thousands and thousands of miles away from the earth.

We know that the moon is a very large place. It must be very, very large or it could not be seen from the earth. We need not be surprised that the moon looks as small as a dish, because it is so very far away.

CLOUDS ACROSS THE MOON

One summer night Mary and Bill were watching the moon.

"The moon looks very near the earth tonight," said Mary.

"Yes, it looks very near," said Bill, "but it is far, far away."

"The clouds are near the earth, and the moon looks as if it were just above the clouds," said Mary.

"The clouds are near the earth," said Bill, "but the moon is far away."

Have you ever watched the moon when it looked as if it were very near the earth?

Sometimes small clouds come between the earth and the moon. The moon seems to be very near the clouds. Both seem to be very near the earth. But Bill was right. The clouds are near the earth, but the moon is far, far away.

Sometimes clouds may blow across the sky and seem to be around the moon. Sometimes a cloud may hide the moon. Then we say, "Oh, the moon has gone behind a cloud." Do you think that is really so?

The moon is much larger than the cloud that hides it. It cannot go behind the cloud.

Can you think how this can be so? Look at a house across the street. Hold your hand near your face. Can you see the house? Of course you know that your hand is smaller than the house. But when your hand is near your face you cannot see the house.

The clouds are near the earth. The moon is far away. The moon looks small, but we know that it is very large. It is many times larger than the clouds. The clouds can hide the moon from the earth because they are near the earth.

Sometimes both moon and clouds look very far away. The clouds look very near the moon and away out in the sky. Only a part of this is true. The moon is away out in the sky, but the clouds are a part of the earth. The moon has no clouds.





MOON CHANGES

Jane and Lucy liked to watch the sky at night. They liked to see the bright, shiny stars. Best of all, they liked to look at the silver moon. One evening Bill and Mary were at their house, and the four children were watching the moon.

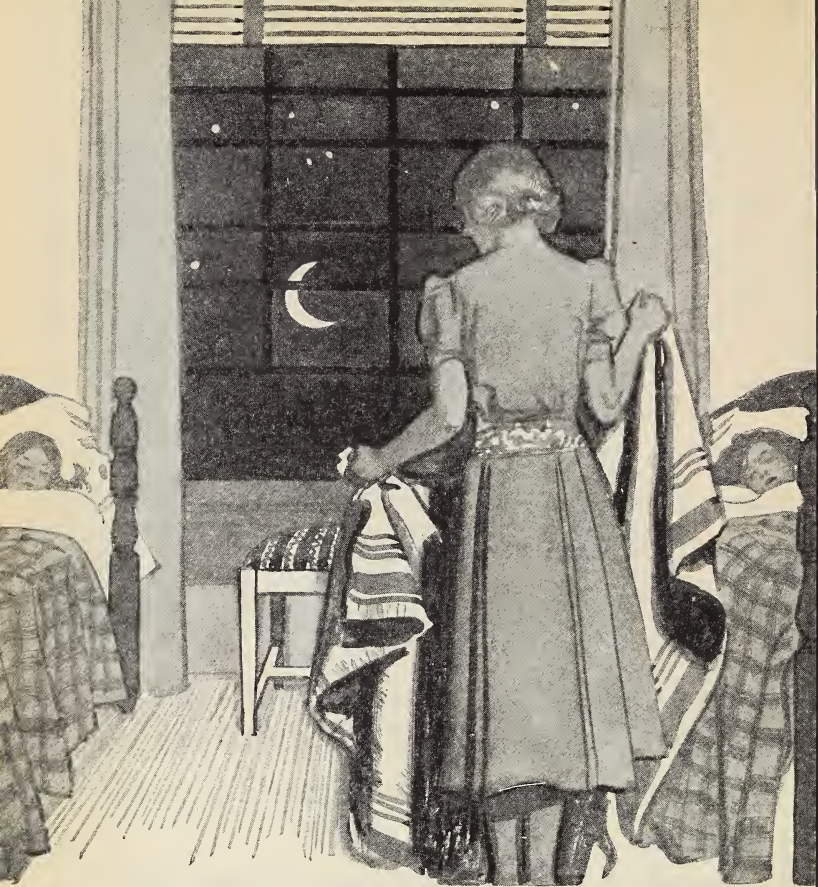
"The moon looks a little different every night," said Jane. "For a while it seems to grow a little larger every night. Then it seems to grow a little smaller every night."

"The moon rises at different times too," said Bill.

"Yes," Mary said. "Sometimes we can see it before we have our supper. At other times it rises just before we go to bed."

"Sometimes it rises long after we have gone to sleep," said Jane. "One night I looked for the moon. I could not see it in the sky. I looked just before I climbed into bed."

"After I had been asleep a long time Mother came into the room to put more covers over us. I wakened up, and I could see the moon rising then. It was just coming up behind the hill. In a little while it began to shine into the room."



“It was nearly twelve o’clock, Jane,” said their mother. “The moon was very late in rising that night. The moon rises a little later and a little later every night.”

Then she said, "On some nights we have no moon at all. Only the stars are shining in the sky."

"I have seen the moon in the day time," said Bill. "It looked like a tiny cloud, but I knew that it was the moon."

"I saw the moon one morning," said Jane. "It was white like a cloud, but it did not look like a cloud. I knew it was the moon."

"I think I saw it one afternoon," Mary said. "It looked like the moon. It seemed like a cloud. I didn't know that I could see the moon in the day time."

Did you ever see the moon in the day time? Did it look the way it looks at night? How did you know that it was the moon?

Jane said, "The moon does not look the same every night. Sometimes it looks big and round. Sometimes we see only a small piece of light."



Here are some pictures to show how the moon looked to Jane.

Have you seen the moon when it looked as it does in these pictures ?

Of course you know that the moon itself does not change at all. The change is in the part we can see. Sometimes we can see a large part of the moon. At other times we can see only a small part.



THINGS TO DO

The moon has two great changes. One change is in the time the moon rises. This changes its place in the sky. The other change is in the part of the moon we can see from the earth.

Here are some things to do to show these changes.

1. Changes in the moon's place in the sky.

Watch the moon each night for a week. Take your place by the window at the same time each night. Does the moon shine from the same place in the sky each night?

Look at the moon some night before you go to bed. Be sure you know from what part of the sky the moon is shining.

Ask your mother to look at the moon when she goes to bed. Ask her to tell you from what part of the sky the moon was shining then.

2. Changes in the way the moon looks to us.

Watch the moon on the same night of the week for a month. Make a picture of the way the moon looks to you each of these nights.

Write the day of the month under each picture.

Put all these pictures in a row.

Look at the day of the month under each picture. What do you think about the changes in the moon?



About the Stars

HOW MANY, MANY STARS!

Did you ever try to count the stars in the sky? You can see thousands and thousands of stars. There are too many to count. No one has ever counted all of them.

The sun gives the earth its greatest light. It gives the earth more light than all the stars together. It gives the earth more light than the moon and all the stars.

The stars give the earth a little light. You can see houses and trees by the light of the stars. You can see to walk by star light. But there are many things that the star light does not let you see.

Can you tell what some of these things are? Can you see the color of flowers by star light? We cannot see the color of a dress. We cannot see colors at all. We cannot see things that are far away.

The stars give us a little light, but they do not give us as much light as the moon or the sun.

STARS ARE FAR, FAR AWAY

Can you tell why the stars give us so little light? Some children think the stars give little light because they are so small. Do you think so, too?

The stars are far away. They are far, far out in the sky. That is why the stars give us so little light.

The moon is far, far away from the earth. The sun is far, far away from the moon. The stars are far, far out on all sides of the sun. They are so far away that they look like tiny spots of light. It is hard to think of anything so far, far away.

STARS ARE SUNS

Stars are real places. They are not just tiny spots of light. Every star we see is a great sun.

Stars look much smaller than our sun does. But most stars are great suns, as large as our sun is, or larger.

Our sun is a very large place. We know that it is a very large place because it gives so much heat and light.

A camp fire is very hot. It burns your face when you stand too near it, but when you walk away from it you do not feel its heat at all.

In summer the sun is very hot. It burns our faces. It is not easy to walk away from the heat of the sun. We can walk into the house. But even the house is warm on a hot summer day.

The sun is far, far away in the sky. It must be very big to give us so much heat.

Most of the stars are as bright and as hot as our sun is. Many stars are much, much larger, much hotter, and much brighter. But they look like tiny spots of light in the dark sky.

How very, very far away the stars are !

What Is the Sky?

One day the children were talking about the sun and the stars.

"The sun and the stars are far, far out in the sky," they said.

"Do you know what the sky is?" asked Miss Gordon.



"I think I do," said Jane. "The sky is the part of the earth that is over our heads."

"That is very funny," said Bob. "Is the sky a part of the earth?"

"Yes," said Miss Gordon, "the air is part of the sky, and it is part of the earth."

"How can the air be part of the sky?" asked Rachel. "The sky is away up high. It is far above the trees. It is farther than the airplanes go. It is away above the air."

"If you think hard, perhaps you can understand about the sky," said Miss Gordon.

"Rachel is right. Part of the sky is very far away. It is far above the air. It is farther away than anyone can measure.

"Here is another thing to think about," Miss Gordon went on. "The sky is not a large roof high over our heads. The sky is very near the ground. The sky begins at the ground. The air that we breathe is part of the sky. The sky goes up and up and up from the ground. It goes farther than anyone can measure."



Do you know what this means? This may help you to understand what Miss Gordon said about the sky.

An airplane is in the sky as soon as it leaves the ground. The sky begins at the ground. It goes up and up and up as far as the sun. It goes up and up as far as the stars.

The air does not go on and on to the sun. The air stays near the earth. People cannot fly outside the earth's air.

An airplane would not bump against the sky if it flew too high. The sky is not a great roof over the earth. It goes on and on outside the air.

The sky is a great place. It goes far, far away. We cannot think how far away or how big the sky is.

Plants and Animals Need the Sun

Do you know —

Why people plant their gardens in sunny places ?

Why you put plants in the window ?
Why you do not put them in the darkest corner of the room ?

Why you put your bulbs in a sunny window to make them grow fast ?

Try these two ways of planting. Put seeds in two dishes of good earth. Set one dish in a sunny window. Place the other dish in the darkest corner of the room.

Which plants grow faster ? Which plants have more leaves ? Which plants have larger leaves ? Which leaves have longer stems ? Can you tell what makes the stems so long ?

Try the same plan with two dishes of bulbs. Which bulbs have flowers first? Do the flowers look the same? Which bulbs have longer leaves? Why are the leaves so long?

Plants need sunlight. They must have much sunlight to grow into strong, healthy plants.

People need sunlight, too. Sick people often sit in the sun so that the sun can help them to get well.



Children must have a great deal of sunlight to be healthy. It helps to make their bones and teeth hard and strong.

More than all, babies need sunlight. Their bones do not grow well without it.

Every living thing needs sunlight — plants, people, and all other animals. We could not live without the sun.

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THINGS TO DO

Here is something that is fun to try on a hot day.

1. Put water into two dishes. Keep one dish in the hot sun. Keep the other dish in the shade. At the end of two hours put your fingers in the water. In which dish is the water warmer? Is it very much warmer? If you have a thermometer, you can measure just how much warmer it is.

2. Leave your dishes of water out of doors. The birds may come to drink or to take a bath. Which dish of water do you think the birds will like better? Why?

3. Put a piece of ice in a dish. Keep the dish in the sun. How long does it take for the ice to melt? How long does it take for the ice water to turn into warm water?

Here is something that is fun to do on a freezing cold day.

1. Put water into two dishes. Set one dish in a sunny place. Keep the other dish in the shade. In which dish does the water freeze first? Can you tell why?

V

How People Use Electricity

ELECTRICITY IS USED FOR MANY THINGS

WHERE OUR ELECTRICITY COMES FROM

WORKING WITH ELECTRICITY

BE CAREFUL OF ELECTRICITY



Electricity Is Used for Many Things

LIVING WITHOUT ELECTRICITY

Emily Ann was a little girl who lived a hundred years ago.

When Emily Ann looked around her home, she did not see electricity being used.

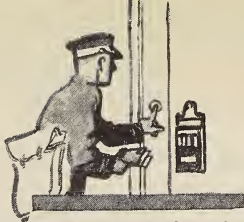
Her mother used wood to cook the food. Most houses were lighted by candles.

Almost no one had an ice box. There were no radios. There were no telephones.

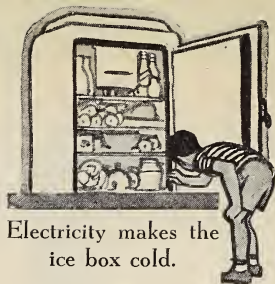
A few people rode on trains and boats. Emily Ann and most other people rode in wagons. There were no automobiles.

In those days people did not use electricity. They did not know very much about it. They did not know how to use it.





Electricity makes the door bell ring.



Electricity makes the ice box cold.



Electricity helps to give us the right time.



Is your food cooked on an electric stove?

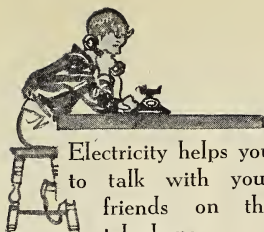


Electricity helps to keep our houses clean.

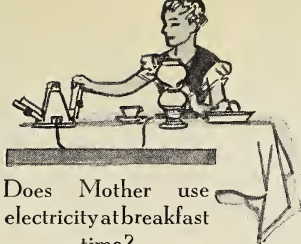
HOW WE USE ELECTRICITY

How much we use electricity! Look about you. Electricity is used in many, many different ways. It is used almost everywhere you go.

Electricity is used in all kinds of ways in our homes. Nearly every house has electric lights.



Electricity helps you
to talk with your
friends on the
telephone.



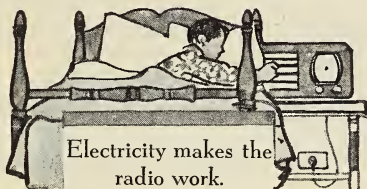
Does Mother use
electricity at breakfast
time?



Electricity makes an
electric fan go round
and round.



Electricity helps to
wash our clothes.

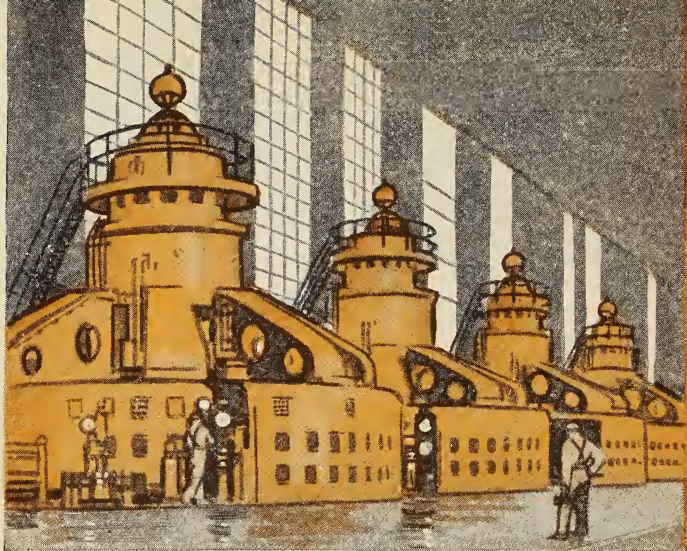


Electricity makes the
radio work.

Electricity does all kinds of work for people.

Can you tell other ways in which electricity is used in people's homes?

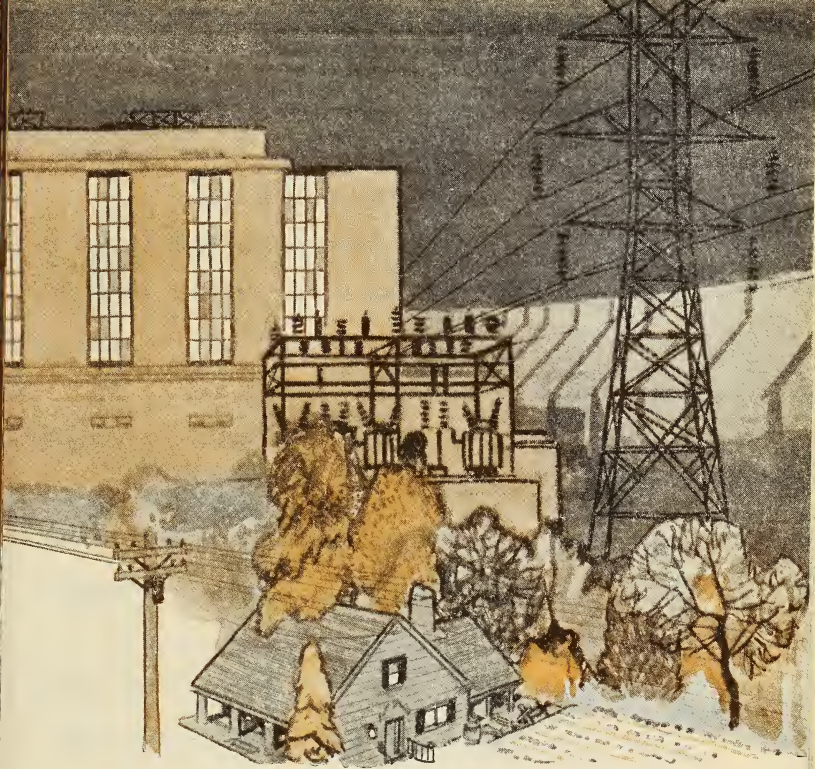
Wherever we look today, electricity is being used. How could we get along without it?



Where Our Electricity Comes From

Do you know how we get electricity for our radios, telephones, electric fans, and all the many other things we use every day ?

Today most towns and cities get their electricity from a place called a power house. Big machines in the power house send out electricity. The building is called a power house, because the big machines send out electric power.



This picture shows a power house. Do you see the wires going out from it? These wires carry electricity to the towns, cities, and farms.

These wires are big wires. They carry much electric power. They must be very strong. They must not break.

They must be placed where they will not hurt people. They are high up over the tops of trees and buildings.

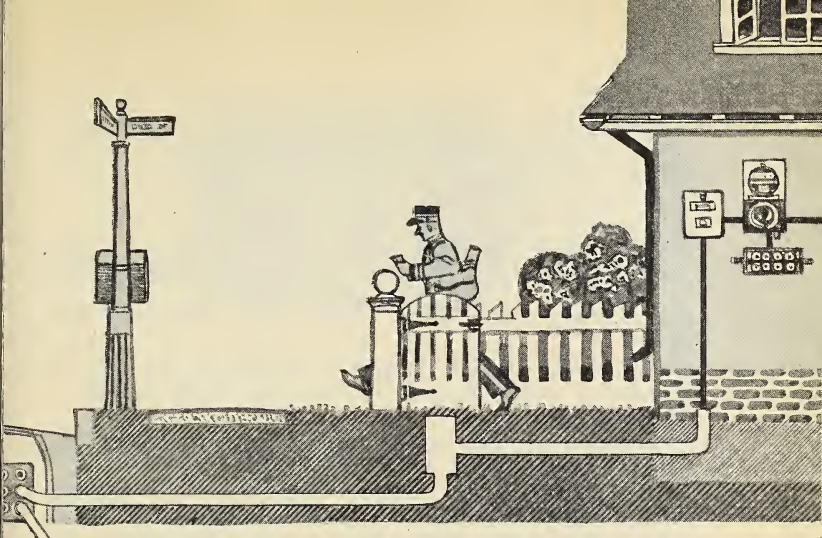
Some cities and towns do not have a power house of their own. Their electric power comes from a power house many, many miles away.

This power house is a very big place. It has many great machines to send out electricity. It sends electricity hundreds and hundreds of miles to many towns and cities.

Do you know how the electricity gets from the power house into your own house ?

Strong wires go out from the great power houses. They go on and on until they come to the city or town where you live.

Smaller wires go out from the big wires. The smaller wires go into your city. The big wires go on to another city.



Wires go along each street in your city. A wire goes from the street wires to each house in the city.

Here is a picture of the way wires carry electricity to people's houses.

Most large cities and towns put their electric wires under the ground. Can you think why ?

Many, many people use electricity. They use it for many, many things. Do you see how it is carried to the people who need to use it ?

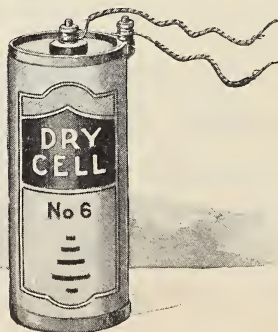
Working with Electricity

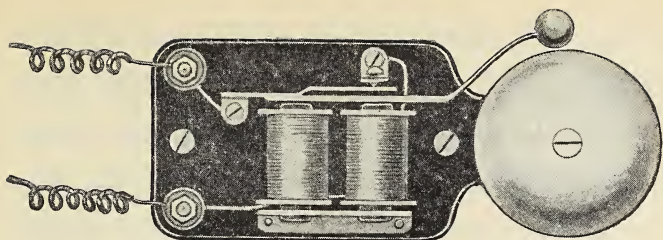
MAKING A BELL RING

Should you like to see something that electricity can do? The best way to see electricity make things work is to use a dry cell.

You can use this dry cell to make a bell ring. When the bell rings, you will know that electricity from the dry cell is at work.

Here is a picture of the outside of a dry cell. Do you see the two little posts at the top? One of these posts lets the electricity go out of the dry cell. The other post lets the electricity come back into the dry cell.





Here is a picture of an electric bell. It is easy to see the place where the bell rings. The bell must have electricity to make it ring. Can you find the place where electricity goes into the bell?

Do you see two little posts on the bell? They look like the posts on the dry cell.

One of these posts lets the electricity come into the bell. The other post lets the electricity go out of the bell.

How does the electricity go from the dry cell to the bell?

You will need some wires. These wires will carry the electricity which makes the bell ring.

Here is a picture of some bell wire.

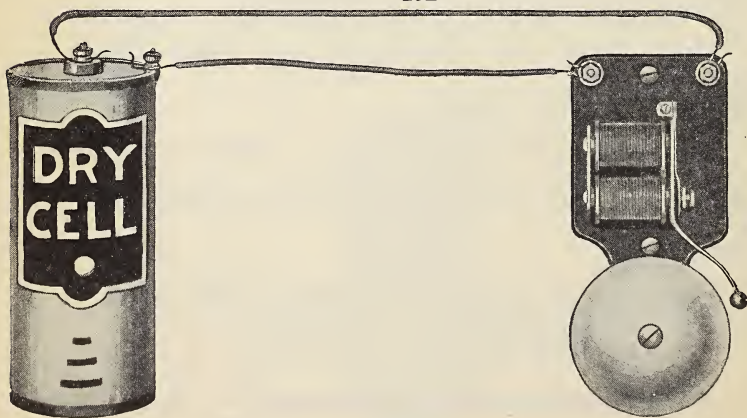


On the outside of the wire is something which looks like string. All wires that are used to carry electricity indoors have a covering. This covering keeps the electricity from going out of the wires where it is not wanted.

Put the end of one wire around one of the posts on the dry cell. Put the other end around a post on the bell.

Put one end of the other wire around the other post on the dry cell. The end that is left will make the bell ring. Put this end around the post of the bell.

“Ting-a-ling-a-ling!” goes the bell, if you have done everything just right.



But you must be very careful to do everything just right. The children in Miss Gordon's room were trying to wire a door bell. They tried to do everything just right.

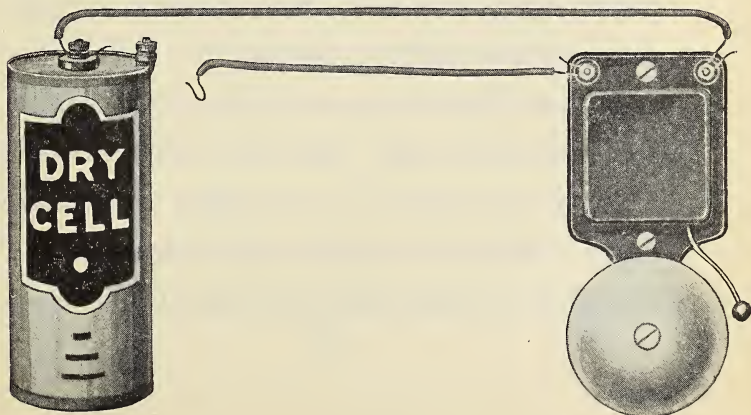
They put the end of one wire around one of the posts on the dry cell. They put the other end around a post on the bell.

They put one end of the other wire around the other post on the dry cell. One end of one wire was left. They put this around the other post of the bell.

But there was no ting-a-ling-a-ling.

"Why doesn't the bell ring?" they asked Miss Gordon.

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Miss Gordon looked at the wires.

"You have put the wires in the right places," she said. "Let us look at the ends of the wires."

They all looked at the ends of the wires. The ends were covered with string covering.

"You should take off some of this covering at the ends of the wires," said Miss Gordon.

"Does just a little covering on the wire keep the bell from ringing?" asked Mary.

"Oh, yes," said Miss Gordon.

"How?" asked Bill.

How *does* the covering at the ends of wires keep the bell from ringing? Can you answer Bill's question?

If you have done everything just right, the bell will ring. But you must not let it ring on and on. It makes too much noise. There is another good reason too. See if you can find out what it is.

Do you know how to make the bell stop ringing? It is very easy.

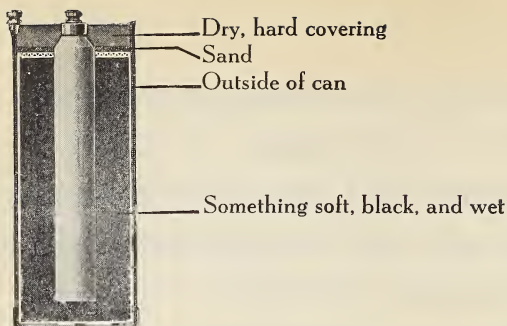
Take the end of a wire away from any post. The bell will not ring, because the electricity cannot get to it.

Electricity goes out from the dry cell through the wire to the bell. It goes from the bell through the other wire back to the dry cell. Around and around the electricity goes, as long as the bell is ringing.

When you take a wire away from one of the posts, the electricity cannot go around this way. The bell stops ringing because the electricity is not at work.

WE CANNOT SEE ELECTRICITY

When the bell rings, we know that electricity is working. But we cannot see electricity. We can only see and hear what it does. We can feel electricity. The electricity in a dry cell cannot hurt us.



If you open a dry cell, you cannot see the electricity. Here is a picture of the inside of a dry cell. You can see some of the things which work together to make electricity. But no one ever has seen the electricity.

A dry cell is not really dry. The things which send out the electricity are in a thick can. Inside this thick can is something which is soft and black and wet. The covering of the dry cell helps to keep these things wet.

This can keeps the wet things wet, but it is dry on the outside. It is made so that electricity can come out only through the posts.

A DRY CELL WEARS OUT

Helen, Jack, and Mary had some dry cells. They could make them ring a bell. They could use them for lights in a playhouse.

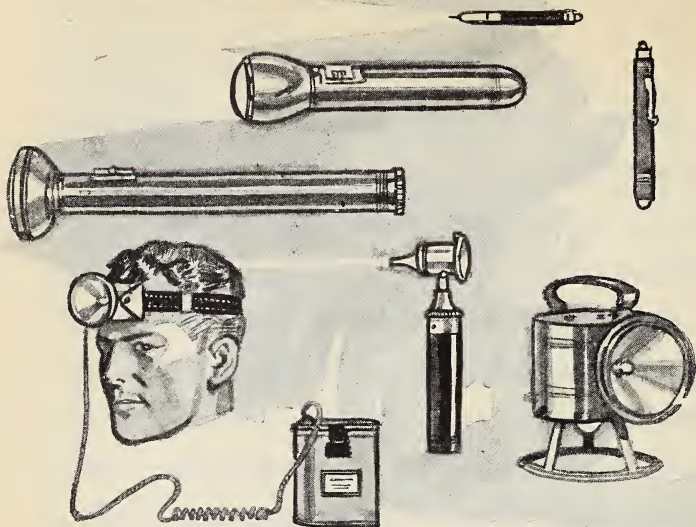
Every day the children used their dry cells. One day they tried to have one ring a bell.

"Ting-a-ling-a-ling!" went the bell. The children could hardly hear it. "Ting-a-ling-a-ling."

By and by the bell did not ring at all. The dry cell was worn out. It could not send out any more electricity.

When a dry cell wears out, there is nothing to do about it. It cannot be used again. You must buy a new one.

Some people use dry cells for their door bells. But the dry cells wear out very soon. Most people use electricity that comes from a power house to make their door bells ring.



DRY CELLS FOR FLASHLIGHTS

Dry cells are very useful for one thing. Many dry cells are made to be used in flashlights.

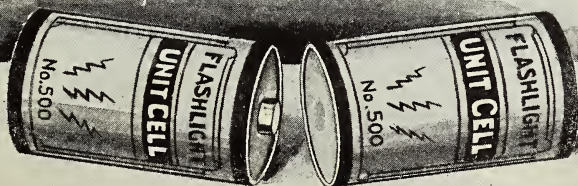
Do you know how to use a flashlight? There are many kinds. Tell about some of the times you have seen people use flashlights. Has the doctor ever used a flashlight to look into your mouth or up your nose when you were sick? He uses a very little flashlight to do this.

The dry cells in a flashlight do not look just like the dry cells you have been using. They are much smaller. They must be very small to go into a flashlight.

The big dry cells have two posts at the top. The small dry cells for a flashlight have only one post at the top. The other post is at the bottom of the dry cell. The electricity goes out through one end and comes back through the other end.

The dry cell for a flashlight has no wires. The flashlight is made in such a way that wires are not needed.

If you leave your flashlight lighted, the dry cells will soon wear out. You should turn it off as soon as you have stopped using it. Then your dry cells will last a long time.



Be Careful of Electricity

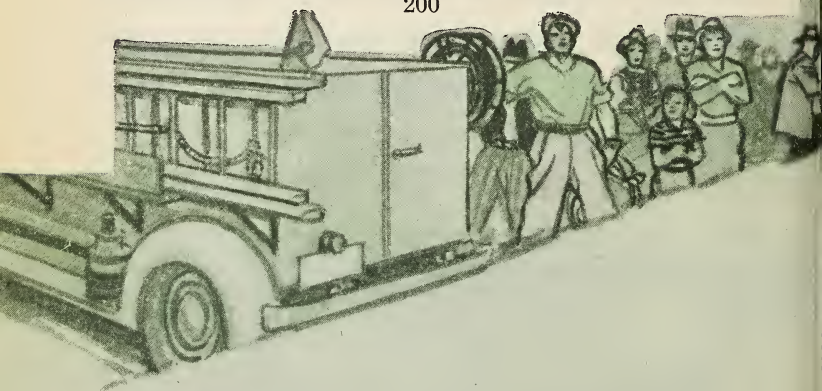
We must be very careful when we use electricity. Electricity from a dry cell will not hurt us. But we must be very careful of the electricity in our homes. Electricity is full of power. It can hurt people very badly.

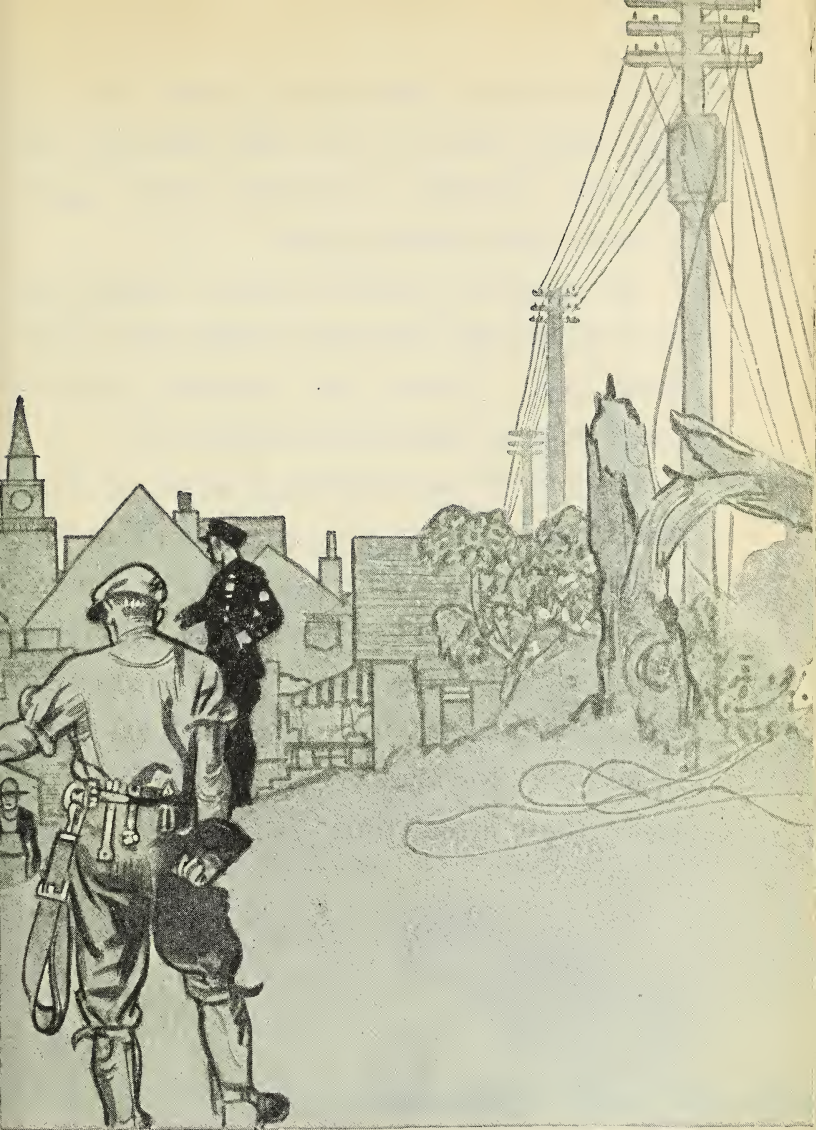
Watch out for these things.

Never use a broken wire. A broken electric wire can make a fire. It can hurt people.

If you see a broken wire in the street, keep far away from it. It may carry electricity that could hurt you.

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Never use a wire that is worn out. If the inside wire can be seen through the outside covering, it should not be used. This too can make a fire.

Be careful of electric lights. Never put your hand into the place where the light bulb goes. Never put anything into a place where electricity comes out.

Electric wires should always be dry. Electricity can come out through a wet place in a wire. This can make a fire.

People need to use electricity. It helps us in many, many ways. But electricity can hurt people, too. We must be very careful. If we are careful, it will help us more than it will hurt us.



VI

The Story of the Ground

HOW SOIL IS MADE

HOW ROCKS ARE MADE

THE WORK OF RUNNING WATER

How Soil Is Made

WHAT IS SOIL?

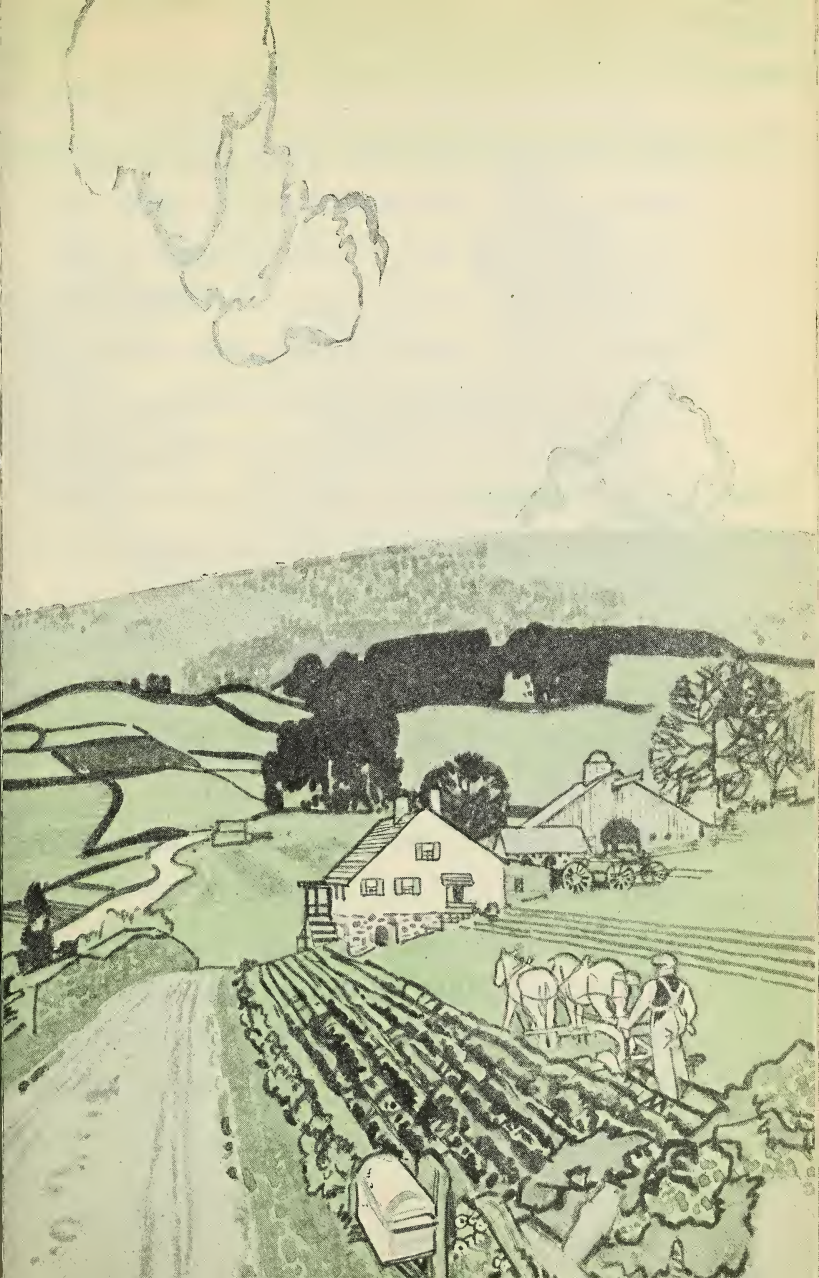
Do you know what soil is?

Nearly every part of our old earth is covered with soil.

Soil is found at the bottom of rivers. The bottom of the ocean is made of soil.

Soil is found at the tops of many high mountains. In some places great rocks show through this covering of soil. In other places there are so many rocks that there is little soil, but in most places of the earth we find this cover of soil.





As we go about in the country we find soil wherever we walk. We find it in the dusty roads. Grass grows in soil. The woods grow in soil. Gardens grow in soil.

City streets are made on top of the soil. Soil is found under houses and stores. It is found under most large buildings.

Jane and Lucy knew about many kinds of soil. They knew about the brown soil in which flowers and vegetables grow in the garden.

They knew about the black soil in the woods.

They knew about the sand on the sea-shore where they liked to play.

They knew about the clay which they used in school. Did you know that clay is soil ?

Jane and Lucy liked to work with clay. They made dishes of clay. They made bears, horses, people, and many other things out of clay.



They liked the feel of the clay in their hands. It was smooth. The grains were very small and fine. The pieces of clay would stick together. They did not fall apart. It was fun to work with clay.

Jane and Lucy liked to build houses of sand. They could not make sand dishes and sand bears. The grains of sand would not stick together. The grains of sand were large and shiny.

Sometimes the girls played with the soil in the garden. Sometimes they made mud cakes. But this was not so much fun as playing with clay or sand.

They learned something about garden soil. This is what they learned.

Mud cakes stay together better than sand houses. Mud cakes fall apart more easily than clay dishes do. The grains of garden soil are finer than grains of sand. They are not so fine as grains of clay.

Do you know what makes this soil which covers the earth? The earth was not always covered with soil. Soil is being made all the time. Where does the soil come from?

Most of the soil of the earth comes from rocks. Some rocks are very hard. You must pound very hard to break them with a hammer. Soil is soft. You can break soil into tiny pieces or grains with your hands. But soil comes from rocks.

What do you think is strong enough to break hard rocks into fine grains of soil ?

Wind and water are always changing rocks. They help to rub them, crack them, pound them, push them, and break them. Water, wind, and weather have helped to make the soil for our earth.



HOW WATER TURNS ROCKS INTO SOIL

Waves of the Sea Make Soil

Jane and Lucy liked to look for pretty stones by the seashore. They liked to keep some little stones because they had a pretty color. They liked to keep other little stones because they were round and smooth. Some of the stones were full of holes.

The girls liked to look at their stones. They liked to play with them.

One day Jane asked, "What makes these stones so smooth and round?"

Her mother said, "Watch the stones when the waves roll over them. The water makes the stones rub against each other. They rub against each other so much that they are smooth and shiny."

"Is it the same way wood is made smooth when you rub it with sandpaper?" asked Lucy.

"Yes," answered her mother. "And here is another thing to know. The water rubs these stones together year after year. At last they rub away into tiny grains of sand.

"This sand too is like sandpaper. It rubs against stones which are carried up on the shore by the waves. It helps to make them smooth and round. At last they too get rubbed and broken into grains of sand."

Lucy said, "The waves must be very strong to rub the stones together so hard that they become smooth and round."

Then she thought how strong the waves had been when she played in the water that morning. Some of the waves had pushed her. She had fallen down. Her father had to help her to stand up again.

The water where she played was not deep, but it was not safe for Lucy without her father to help her.



Pound, pound, pound! The waves roll against the shore and break up the stones. They roll against great rocks, which are sometimes higher than houses. The waves often break off great pieces from these rocks as they pound on them.



The great pieces are rolled around by the waves. At last smaller pieces break off. These smaller pieces of rocks roll about in the water. They often hit against each other with a bang. They bang against the shore. At last they are broken up into very small stones. These are the little stones which children like to pick up and keep.

All the stones and all the sand were once great high rocks on the shore. The water broke them, ground them, cracked them, rubbed them. At last the great rocks were tiny stones and grains of sand.

The water is still doing this. It will never stop making soil so long as there are rocks against which it can pound.

Not all the soil on the earth is sand. Not all the soil was made by the sea. Not all of it was made by rivers or lakes or little brooks. But much soil was made from rocks.

Freezing Water Breaks Rocks

Many times water gets into the cracks and holes in rocks. Sometimes rain falls into these cracks and holes. In very cold weather this water freezes into ice.

Very often the cracks and holes are not large enough to hold this ice. Many times the ice is stronger than the rocks. It makes the rocks crack and break.

Many rocks are broken again and again. They are broken by the water which freezes in their cracks year after year. At last many smaller stones are left where the big rocks once stood.

Sometimes the pieces of broken rock roll down the side of a hill. As they go rolling and bumping along they break into smaller pieces. Sometimes they hit other rocks. They break up these rocks as they roll and bump against them.

At last the rocks wear away into grains of soft soil.



Rain, Snow, and Running Streams

Rain and melting snow carry many of these pieces of rock into the streams. Here they hit other stones which the water is carrying along.

These stones all roll and bump against each other. They often break up into smaller pieces. The corners of the pieces break off. The pieces wear away into smooth, round little stones. In time these little stones are ground into fine soil.

The tap, tap, tap, of the rain wears away rocks. The rub, rub, rub, of melting snow and running streams wears away the sides of the rocky hills. The hard rocks wear away into soft soil.

HOW THE WIND HELPS TO MAKE SOIL

The wind too is a great helper in making soil.

Have you ever seen an old flag that had been blowing in the wind for a long, long time ?

What were its sides and ends like ? Were they wearing away ?

If the flag had been left flying long enough, it would have been blown to pieces. Nothing would have been left of it.

The wind wears or blows away the rocks in much the same way. It wears them away very, very slowly because they are so hard and strong.



Here is a picture of rocks which have been worn away by the wind.

You cannot see the pieces of the flag which the wind blows away. They are so small that no one sees them. The pieces which the wind wears off from rocks are small and fine, too. No one sees them as they leave the rock.

But pieces as fine as dust are being worn from the rock all the time. This rock dust falls to the earth as soil.

The wind blows sand and other kinds of soil against the rocks. The rocks by the seashore are wearing away all the time. They wear away when the wind blows sand against them.

Almost every place where the wind blows, it carries dust and sand. We find dust on boats at sea. The wind helps to make dust. It carries dust about to all places on the earth.

PLANTS AND ANIMALS HELP TO MAKE SOIL

You know that soil helps to make plants grow. Did you know that plants help to make soil?

This is how they do it.

Plants grow in soil. Their roots wind in and out around the grains of soil. When plants die, many of them are never cleaned away. They drop to the ground and lie there. Leaves, wood, and roots turn into soil as they lie in the wet ground.



The rain pushes them down into the earth. They grow very soft. They wear away into small pieces. At last they are a part of the ground.

More soil is made on top of them. After a while you could not tell the plants from the soil.

This makes good black soil. This kind of soil is found in the woods.

Mosses and other plants grow on the sides of many rocks. These plants use up a part of the rock when they are growing. Sometimes this wears away the rocks.

There are many ways in which plants help to turn rocks into soil.

When insects, birds, and other animals die, they help to make soil. Their bodies go down into the earth. They wear away into little pieces. At last all these animals are a part of the ground.

Plants grow well in this kind of soil. People like to have this kind of soil in their gardens.

Fish help to make good soil too. Their bones turn into good soil as the bones of other animals do. Many water animals have shells. Shells are broken into small pieces by wind and weather. These fine pieces are a part of the soil.

THINGS TO THINK ABOUT

Wind, water, and weather make soil. They rub and wash and pound and blow against the rocks. They wear the rocks away. They turn the rocks into dust. This dust is soil.

This takes a long, long, long time. It would take you a long time to make soil from stones. And how little soil you could make!

What a long, long time it has taken to make the earth's cover of soil! Rocks are very, very old. The earth is much older than its covering of soil. It is older than many of the rocks.

THINGS TO DO

1. Bring to school as many kinds of soil as you can find. Bring some sand. Bring some clay. Bring some soil from the garden and some soil from the woods.

Do these soils look alike? Do they feel alike?

Put some of each kind of soil on a piece of paper and look at them. Can you see something about each kind of soil that you do not see in the rest?

2. Do you like to save stones? Do you like to see how many kinds of stones you can have?

Put the hard stones together. Put the soft stones together. Some stones are very soft.

Put the colored stones together. How many colors can you find?

3. Should you like to try to turn some rocks into soil? Here are some ways to go about it.

A

Take a piece of hard rock. Pound it with a hammer as hard as you can. Does it break? Pound the pieces again and again. Do they get smaller and smaller?

Does it take a long time to make soil in this way? Is it hard work?

B

Take two rocks which are not very hard and which are not smooth on the outside. Rub them together.

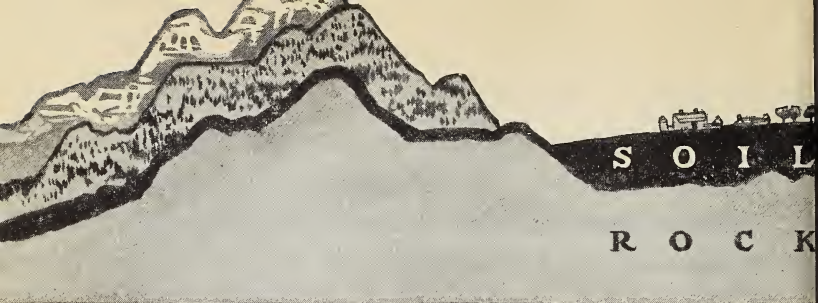
If you rub a long time, will they make a little soil? Can you make them smooth by rubbing them together?

C

Take some smooth stones and some stones which are not smooth. Take some sandpaper. Rub the sandpaper on the stones which are not smooth.

Does this make them smooth? Do you need to rub a long, long time to make them smooth? Can you make them look as smooth as your other stones?

When your sandpaper rubs on the stones it makes dust. Is this dust soil?



How Rocks Are Made

A FLOOR OF ROCK

Did you know that there is a floor of hard rock under all the earth? If men go far enough into the ground, they always find rock.

A floor of rock is under the soil of your yard.

Under our streets and big buildings we find soil. But under this soil is hard rock.

Great rocks are under the mountains. Rock is under the soil in the woods. It is under the sand at the seashore.

A floor of rock is under the bottom of the sea. Sometimes mountains of hard rock are found at the bottom of the sea.



A great floor of rock is found in all parts of the earth.

Long, long ago the outside of the earth was all rock. No plants or people or other animals lived on the earth in those days. There was no place for anything to live. Rock was everywhere.

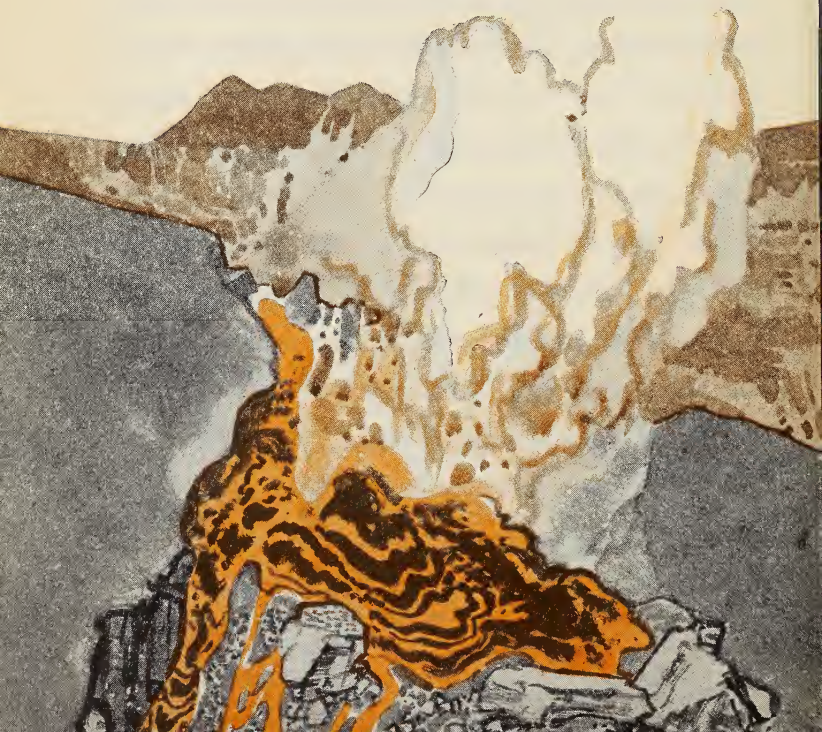
You know that rocks are very, very old. But rocks are being made all the time. New rocks have been made as long as the earth has had rocks. New rocks are being made right now.

Should you like to know how the rocks that you see have been made? The next part of the story will tell you.

SOME ROCKS HAVE BEEN MADE BY HEAT

At times, rocks on the inside of the earth have grown very, very hot. They have grown so hot that they melted.

You have watched water boiling. You have seen the steam push up the cover of the dish. Sometimes it pushes up the cover and boils out of the dish over the stove. Steam can push up a heavy cover.





These melting rocks did something like this. They pushed a big crack or hole through the top of the earth and made their way up into this crack. At last they grew cold and hard. They turned into hard, hard rock. Sometimes the hot rocks grew cold and hard without breaking through the top of the earth.

Rocks which have been made by heat are very, very hard. Granite is one of our very hardest rocks. Granite was made in this way. We use granite to build things which we want to have last a long time.

HOW ROCKS ARE MADE FROM SOIL

The Brown family were taking a ride in their automobile. They passed farms. They passed fields and woods. They came to a road which had high rocks on each side. The rocks were very flat.

"They look like the layers of a giant cake," said Bill.

As they rode along they passed many places where layers of rock were piled up. In some places the rocks were piled higher than the automobile. In other places the rocks were no higher than Bill's head. Grass and trees grew on top of some of the rock layers.

Bill said, "How did the rocks get piled up like that? Not even a giant could pile rocks that way."

"No," laughed his father. "No giant could pile such big rocks. Those rocks piled themselves up."

Mary and Bill laughed. "You are just making fun," they said.

"No, I am not making fun," said Mr. Brown. "What I am telling you is true. The rocks piled themselves in layers."

Should you like to know how this happened?



The rocks did not pick themselves up to make a pile. They were made in the spot where they were found.

Long, long ago a layer of mud formed in that spot. Then there was more mud. It was piled on top of the first layer. Then more and more mud formed.

The mud on top pushed down on the mud under it. It pushed so hard that the mud on the very bottom was made very hard. At last it turned to stone.

Years and years passed by while this was taking place. More years than you can count passed by while the mud was turning to stone. You might see for yourself how this is done.

Do you like to watch the water in the streets after a hard rain storm? It often makes a little river. Sticks, papers, stones, leaves, and all kinds of rubbish are carried along by this little stream.

Much of this rubbish is left near the hole where the water runs under the street. Sometimes, after a storm is over, a thin cover of mud is left on the street.

Do you live in the country? Can you watch a little brook that runs through the fields?

After a hard rain, leaves, sticks, and mud are found on the sides of the brook. The sides did not have this mud and these sticks and leaves before the rain, but after the rain, mud and rubbish are all around.

More mud and more rubbish have been carried away by the stream. At last most of the load drops slowly to the bottom of the stream and stays there.



The same thing takes place in large rivers. Mud, stones, sticks, leaves, and other rubbish are carried along. The fast-moving waters carry them along for miles and miles.

By and by the waters move more slowly. The slow-moving waters do not carry so much rubbish. They do not carry so much mud. Some of it drops down on the sides of the stream. Some of it drops down on the bottom.

The load of mud and rubbish drops down. It pushes hard on the part that is under it. For years and years mud drops down. It pushes hard on the mud that is under it. It pushes very, very hard on the part that is at the bottom of all. At last this part turns to stone or rock.

Some of this rock is made of sand. It is called sandstone. Many houses are made of sandstone. Stores and other city buildings are made of sandstone.

You can tell sandstone when you see it. It looks like millions of grains of sand all sticking together.

Other rocks are made from clay. Clay is softer and finer than sand. The rock which comes from clay is called shale.

Shale is smooth. It breaks easily and it lies in flat pieces in the ground.

Shale and sandstone are not the only kinds of stone that are made in this way. There are many other kinds. It takes years and years and years to make any of them. We cannot see mud as it turns to rock. Rock is made very, very slowly.

THINGS TO DO

Mud pushes very hard on the part that is under it. Here are some ways to see how heavy a load something can be.

1. Find many big, big books.

Place one book on top of another. You should have a pile that is two or three feet high.



Do you think the top book is pushing down hard on the bottom books? Put your hand under the top book. Does it push very hard?

The next part is not so easy. Try not to let the pile of books fall over. Put your hand under the bottom book. How does your hand feel now?

Think of a pile of books as high as the school. Think of putting your hand under the bottom book. Oh my! Where would be the best place for your hand?

Very often mud is piled as high as this. How very hard it pushes on the bottom part!

2. Take a piece of soft bread. Put a paper over the bread. Place a pile of books on top of the bread.

Let the pile of books stand on the bread all night. On the next day take the pile of books away.

How does the piece of bread look? Is it thinner than it was? Is it harder than it was?

Now think of a great pile of mud. Can you see how the part on the bottom can turn to stone?



The Work of Running Water

LITTLE BROOKS

A little brook ran through the fields on Mr. Stone's farm. On the sides of the brook were large stones. In the bottom of the brook were tiny stones and sand.

Helen liked to play in the brook. She liked to walk about on the stones and on the soft sand.

In the hot summer days of July and August the water just covered her feet. The banks of the brook were high. When she sat on the bank she could just put her toes into the water.

"The banks of the brook are high," said Helen. "The brook itself is very small. A little brook does not need so much room as this one has."

Can you tell why the little brook had so much room in which to run? This is what happened almost every year.

In the spring there was a great deal of water in the little brook. The melting snow gave it water. The rain gave it water. In the spring there was rain, rain, rain! The rainy weather gave more and more water to the brook. The brook grew larger and larger.

In the spring it was no longer a very little brook. It was a big stream. The water came up to the top of the banks. Sometimes it ran over the sides.

Then the water in the brook ran along very fast. It cut and pushed and rubbed as it ran along. It was very strong.

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Such a lot of water must have some place to go. Each year the brook rubbed away more soil. This made the bottom of the brook a little deeper. It made the banks a little higher.

Each year more rocks and soil were rubbed away.

Each year the stones were made a little smoother and rounder. Each year they were made a little smaller.

Helen's father said, "Each year the banks of the brook grow higher. Each year they are a little higher than they were the year before. This is because the bottom is carried away by the water."

"How high will the banks of the brook be when I am as old as Mother?" asked Helen.

"That is hard to tell," said her father. "They are only a little higher now than they were when I was a boy."



"They have changed very slowly. But we might have a great flood. This might change them greatly in just one year. It is hard to tell what running water will do to soil."

BIG RIVERS

Helen's mother told her about a great river in the West. Its banks are very high.

"This great river has cut its way down, down, down, through thousands of feet of rock," she said.

"People come from all over the world to see this wonderful river. They stand at the top and look down. They look down over the sides at the river. Far, far down they see something which looks like a long yellow ribbon. It is the river.

"That winding yellow ribbon is really a large river. It looks as small as a ribbon because it is a mile away. The banks of the river are one mile high."

“One mile high!” said Helen.

Then she tried to think how far a mile is.

Her grandfather lived a mile away. Helen often walked to her grandfather's home. But she was always glad to sit down when she came to the house. Her legs were tired after a mile's walk.

Mrs. Stone said, “Yes, the river has cut its way for a mile down through the rock. Think how much soil the river has carried away.”

Helen said, “How fast the river must run to cut a mile into the earth! How long did that take?”

“More hundreds and hundreds of years than you can think of,” said Mrs. Stone. “The river is very, very old, you see. The rocks are very much older.”

THINGS TO THINK ABOUT

It takes a long, long time for rocks to wear away into soil.

The children were talking about this one day.

Jack said, "It takes years and years for the water to wear away rocks on the seashore."

Helen said, "It takes a longer time for rains and melting snow to rub away rocks on the hills and mountains."

Bill said, "It takes hundreds of years for the ice to crack the rocks. It takes hundreds of years to break them into soil."

These children were right. A long, long time is needed for these wonderful changes to take place.

Many, many years are needed for rocks to turn into soil. Years and years and years go by while wind, water, and plants turn rocks into soil.

You could not count the years which go by while soil is being turned back into rock.

You could not count the years which go by while a river cuts its way through rock.

The earth is very, very old.

VII

How Animals Grow Up

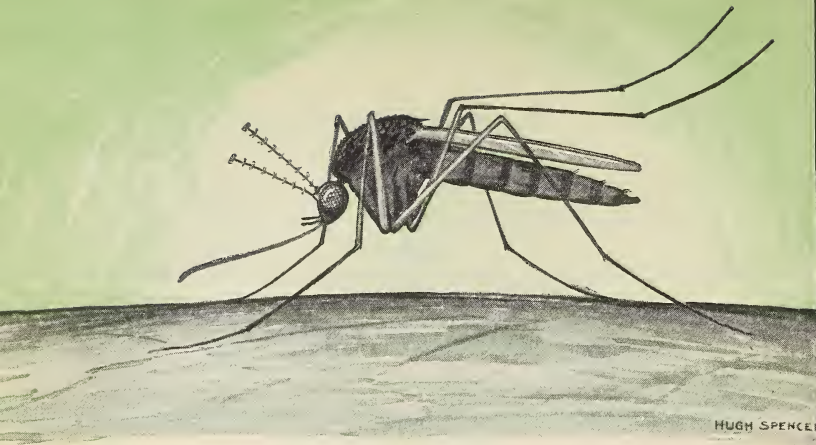
MOSQUITOES

BULLFROGS

ENGLISH SPARROWS

BROOK TROUT

SKUNKS



Mosquitoes

Who does not know about mosquitoes ! How they go buzzing around our heads in summer ! How hard we try to make them fly away ! But some of them are sure to find their way to our skin. Then you know the rest !

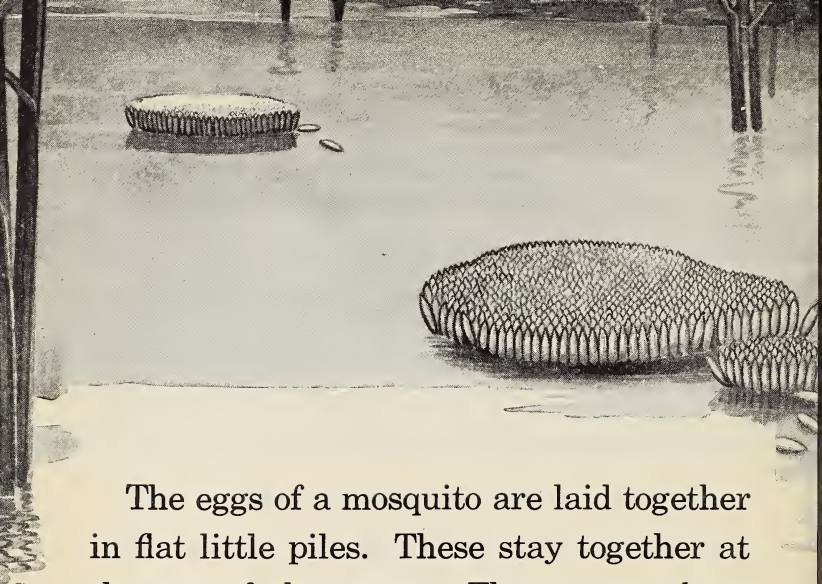
Do you know what a mosquito does when it "bites" ? It does not really bite at all, for it has no teeth. The mosquito pushes a long, fine tube through your skin into your blood. Then she drinks as much blood as she can through the tube.

Try to watch a mosquito as it bites you. If you can do this, you may learn some new things about mosquitoes. You can see it put the long, fine tube into your skin. You can see it drink and drink. You can see its body get full of blood. When its body is full, it pulls the tube out of your skin. Then it flies away.

Only a mother mosquito will "bite" you. A father mosquito gets his food from plants.

Mosquitoes are found in all parts of the earth. They are found in almost any place where there is standing water. Most lakes or ponds have many mosquitoes. Almost any place where water stands on the ground for a week may be a good place for mosquitoes. Water which is left standing out of doors in old cans or dishes sometimes will have mosquito eggs in it.

Mosquitoes grow up very fast. In a short time they go through great changes.



The eggs of a mosquito are laid together in flat little piles. These stay together at the top of the water. They move about together like tiny, flat boats.

In a day or two little worm-like things come out of the eggs. The real name for one of these worm-like things is "larva" but most people call it a "wiggler." It is called a "wiggler" because it wriggles about all the time.

It has no wings. It lives in the water. It can only swim. When it swims, it holds its body like an S. Then it wriggles its body the other way, like this: 2.

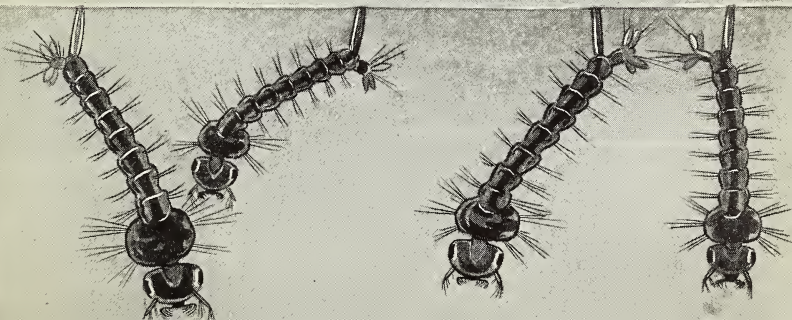
These two ways of holding its body move the young mosquito through the water very fast.

The wriggler finds its food in the water. It eats water plants and animals that are too tiny for us to see.

The wriggler cannot breathe in water. It comes to the top of the water for air.

Here is a picture of some wrigglers taking in air.

Do they look as if they were upside down? They would be upside down if they took in air as we do. But they do not take it in through noses in their heads. So their heads can hang upside down in the water.



At the end of the body are many little hairs. These hold the wriggler at the top of the water. Breathing tubes open from this end of the body. These tubes take in air. When these tubes are full of air, the wriggler goes back into the water. It can stay there a short time looking for food. Then it must wriggle to the top for more air.

In a week or two this little animal goes through another change. The larva, or "wriggler," changes to a pupa. Now it has a very large head and a very small body. Here is its picture.



The pupa looks right side up when it takes in air. The breathing tubes are no longer at the end of the body. They are on the top of the head. These tubes are pushed out of the water for air. When the breathing tubes are full of air, the pupa goes swimming about again. But it does not swim about to get food. The pupa does not take in food at all.

The pupa swims about for four or five days. Then another great change comes. The home of this little animal is no longer in the water. It is in the air.

The skin of the pupa breaks down the back. Out of this comes the mosquito with wings, legs, and all. At first its body is very soft. Its wings are not ready to fly. It does not look like a mosquito.

The skin stays on the top of the water like a tiny boat. The mosquito stands on this for a little while. Its body grows hard and its wings grow strong.

Mosquitoes do not fly very far from their water homes. Sometimes the wind carries them far, far away.

That is why we find mosquitoes in many places where there is no standing water. That is why people should not leave standing water near their homes. The wind may blow mosquitoes to it. They lay their eggs in the water, and then there are more mosquitoes.

It is a good thing that many animals use mosquitoes for food. Fish, frogs, toads, and water birds eat the mosquito when it is a larva and a pupa. Birds, frogs, toads, snakes, and many other animals catch mosquitoes as they fly about in the air.

Many, many animals use mosquitoes for food. But the world has millions and millions of mosquitoes, just the same. They grow up so fast and lay so many eggs that they keep living on the earth.

Bullfrogs

Helen and Jack liked to hear the sound of the frogs in early spring. The sounds came from a pond on their farm.

Helen thought the sound was like the ringing of little bells.

"Some frogs make a noise that sounds like a big horn," said Jack.

"When we hear the sound of the frogs, we know that spring is here," said Mr. Stone.

There were many kinds of frogs on the farm. Some were large and made loud sounds. Some were small and made sounds almost like a song.

Many frogs were in the water most of the time. Some frogs lived on the ground in the woods and fields. Some frogs lived in trees.

The biggest frog that made the loudest sound was an old bullfrog.



Bullfrogs live in the water. In the spring the mother bullfrogs lay their eggs in the water. They lay many, many eggs. One bullfrog has been known to lay as many as twenty thousand eggs.

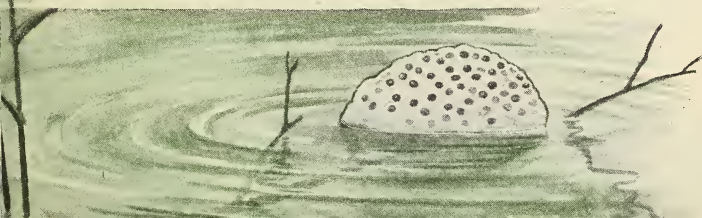
These eggs are very soft. They stick together as they are laid and they stay near the top of the water. They look like great pieces of white jelly.

At the bottom of the page is a picture of some frogs' eggs. Can you see a small dark spot in each egg? This small spot will grow into a tadpole.

In a week the tadpoles have come out of the eggs. Tadpoles do not look like the mother bullfrog. They have no legs. They look as if they had only a head and a tail. The mother bullfrog does not take care of the young tadpoles. She does not need to. They can care for themselves.

The young tadpoles swim about as soon as they are out of the egg. They eat water plants and animals that are too small for us to see.

In one way tadpoles are like fish. They breathe the air that is in the water. They take in air through their gills. They cannot live out of water.

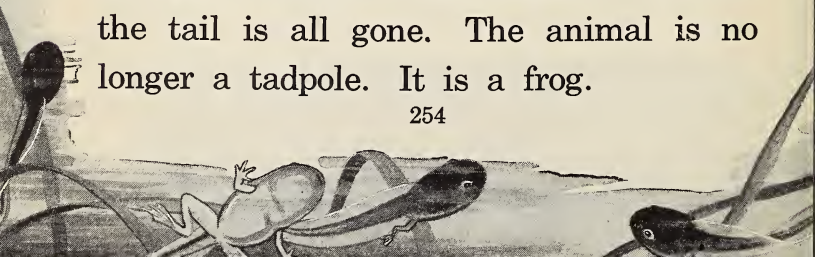


Bullfrog tadpoles are green-brown on top. The under side is yellow. Their tails have round black spots. They swim and eat and grow and grow and grow.

At the end of summer the tadpoles are large and strong. But they have no legs. When frost comes they go under stones or into the mud. Here they stay until the warm spring days. Then they come out of their resting places.

For another summer they swim and eat and grow. Now a change is taking place. The tadpole begins to grow back legs. For a while the tadpole looks like a big head with legs and a tail. But the tail grows slowly smaller and smaller. By and by the front legs begin to grow.

The legs grow larger and larger. The tail grows smaller and smaller. At last the tail is all gone. The animal is no longer a tadpole. It is a frog.



A frog cannot breathe the air that is in water. A frog does not take in air through gills. It breathes with lungs. It must come to the top for air.

Each year frogs go into the mud for the cold winter. Each spring mother frogs lay eggs in the water.

When a bullfrog tadpole turns into a frog, it is about two inches long. Some bullfrogs grow to be very large. They are seven or eight inches high as they sit at rest.

Some bullfrogs live many years. The bullfrog seven or eight inches high was in the egg about ten years ago. Were you alive ten years ago?

Many bullfrogs live to be very large and very old. But many do not live to grow up. They are used for food by many animals. Many frogs are eaten by snakes. Many are eaten by turtles, large water birds, and other animals.

Bullfrogs have two ways of escaping from other animals. They have long, strong back legs. How far a frog can jump with these long, strong legs! Sometimes they can jump far away from other animals.

Bullfrogs are green-brown in color. So are stones, old leaves, mud, and other places where they stay. At times they sit very still. You have to look and look before you can see them. For hours they do not move. But they see everything that moves about them. They see every shadow. At just the right time away they go with a big jump into the water. Once more they have escaped.

Sometimes Helen and Jack went down to their pond to look for frogs. As they came near the water they were very still. But plop, plop, splash! plop, splash! The frogs jumped into the water before the children could see them.



Jack and Helen stood very still. At last they could see some of the frogs. They liked to watch the frogs eat. Bullfrogs eat many things. They eat insects and worms. They eat snails and small fish. They eat smaller frogs too, and other small animals that live in the water.



A frog's tongue begins at the front of its mouth. It can move the back of its tongue but not the front. It can throw the back of its tongue out of its mouth. Its tongue is long and sticky. It throws out its tongue at every small animal that comes near it. An insect is caught and eaten as quick as a flash.



Helen and Jack liked to watch the bullfrogs catch insects with their long, sticky tongues. They liked to watch them eat large pieces of food. The frogs pushed this food into their mouths with their front feet. They made funny faces as they ate the food.



We can be glad that there are many frogs in the world. They eat many, many insects. Many of these are insects that eat food plants or the leaves of trees. Frogs help to get these insects out of the way. Frogs and toads are good for the farmers. They are good for all gardens.



English Sparrows

Almost anywhere you go you can see the dusty, noisy English sparrow. You can see him in the city. You can see him in the country.

He is very much at home in the busy streets of the city. What does he care for horses and wagons? What does he care for automobiles and their horns? He hops about unafraid.

Automobiles, horses, wagons, or street cars can come very near him. But he hops away to another place and goes on eating.

In the city many people feed English sparrows. But they can find food for themselves in almost any place.

In the country they often take the food of other birds. They are great fighters. They drive away blue birds, robins, wrens, and swallows and take their food.

They eat buds, flowers, and fruits of trees and bushes. They eat the oats, wheat, and other grains the farmer needs.

In winter English sparrows do not fly to the warm South as some birds do. They stay wherever they are. They can stand the coldest winters. When they can find no other food in winter, they eat the seeds of weeds. Then they are a little help to people. Can you tell why?

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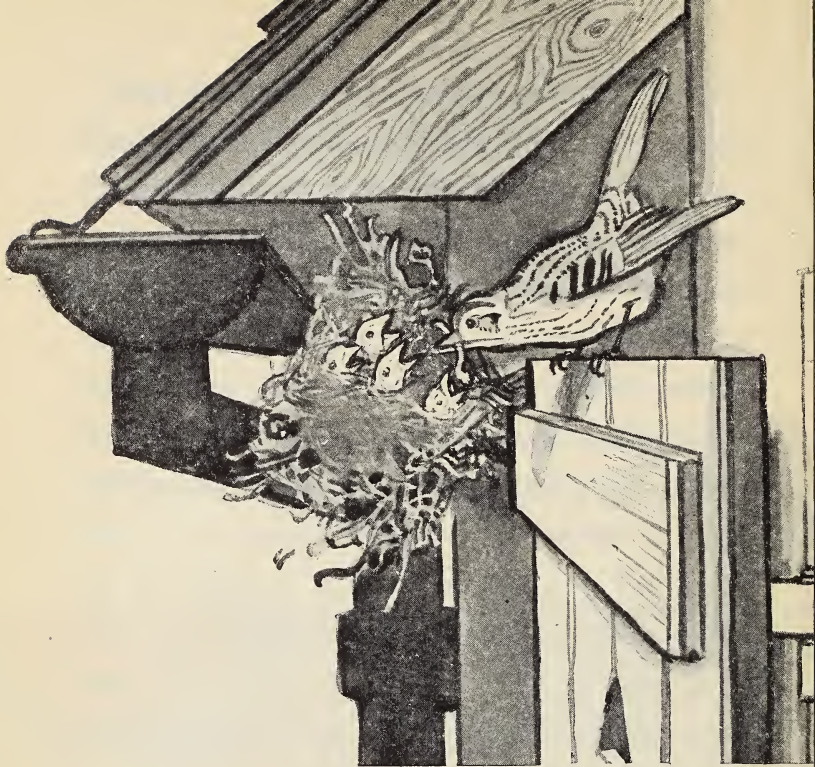


Early in the spring the sparrows begin to get their nests ready. The English sparrow is one of the first birds to begin to make a nest. It often uses the empty nests of other birds.

When blue birds, wrens, and swallows come North, they often find sparrows using their nests. Sometimes they drive the noisy sparrows away, but more often they have to build new nests.

When a sparrow makes a nest, it is not a pretty one. It uses anything it can find. Grass, leaves, string, paper, or any kind of rubbish makes a nest that is good enough to please it.

The sparrows put their nests in all kinds of places. Many times they put them where people do not want them. They build them at the tops of houses and in corners of the roof. They put them at the tops of electric street lights.



People do not like to have these nests on their houses. Sparrows are very dirty birds. People cannot have clean houses when the nests of sparrows are there.

The English sparrow almost always lays five eggs. These eggs are white with little black spots on them.

In about two weeks young birds come out of the eggs. These birds have no feathers. Their eyes are shut. They have big heads. They eat all the time.

For about seven days the mother bird brings them food. She brings many kinds of insects. She brings some kinds that eat the farmers' plants.

When sparrows are feeding their young, they are a help to the world. But most of the time they are not a help to anyone.

In about a week the baby sparrows have feathers and are ready to fly. Then they can find their own food. They leave the nest and fly away. They can take care of themselves now.

Many English sparrows have five or six families a year. The young birds grow up very fast. The mother bird can care for a new family in a short time.

This makes very, very many English sparrows living on the earth.

These sparrows are strong and they are great fighters. They will try to drive away animals which might hurt them. They are quick and can escape from their enemies. They can eat almost any kind of food. They live where not many animals can use them for food. Some English sparrows live for many years.

Most birds are helpful. Many of them are beautiful to look at. Their songs are beautiful to hear. But, best of all, they eat insects that are bad for plants. They eat the seeds of weeds which farmers do not want on their land.

But English sparrows are helpful only once in a while. Their song is not sweet. It is loud and noisy. They are dusty birds, and their feathers are not smooth and fine. But the very, very bad thing about them is this — they drive away other birds which are helpful to people.

Brook Trout

If you ever have seen a brook trout, you will want to see another.

Brook trout live in fast-running streams of water. They jump and swim along as the water runs over the rocks. The water shines in the sunlight. The fish shine too. The sun shows their bright colors.

Brook trout are beautiful to look at. Their bodies are brown-green. Some trout are covered with little brown-green spots. Some are covered with lines of brown-green. On their sides are spots of bright red. Should you not like to see a trout?



You have seen a fish swim. On the sides and under part of the body are things that look like little fans. These are called "fins." A fish swims with its fins. It uses its fins to push itself through the water.

The fins of the brook trout have black and orange lines. Do you not think the trout must look very fine in all their bright colors ?

Most brook trout live in the cold water of fast-running streams and rivers. They have to be strong to swim in the fast-moving waters.

The trout which live in running streams are small fish. Those which live in cold rivers grow to be as much as twenty or more inches long. Those which live in big lakes are still larger.

Trout lay their eggs in the fall. At that time the water begins to grow very cold. The eggs stay in the water all winter.

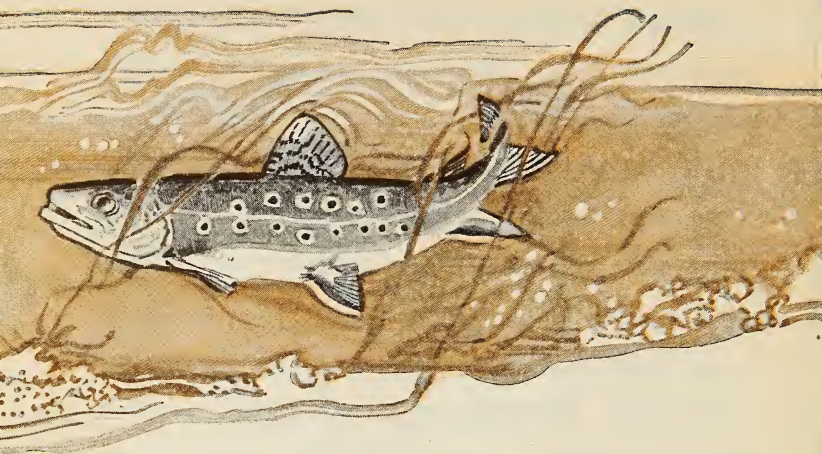
When spring comes the water begins to grow warmer. Then the young trout come out of the eggs.

In some places the winters are very long and cold. Here the eggs have been laid about five months before the young fish come out.

In other places winter is not so long and cold. Here the eggs may be laid only two or three months before the young fish come out. They come out when the water grows warmer.

The young fish can care for themselves when they come out of the eggs. They can find food for themselves. They can swim as soon as they are out of the eggs. They do not have the care of a mother or father fish.

Trout do not lay so many eggs as some fish do. Young trout do not lay so many eggs as the older trout do. A year-old trout lays only about 250 eggs.



People now are trying to help trout to go on living. If people did not help them, soon there would be no more trout in the world.

Fishermen like to catch brook trout. They are pretty fish. They taste good when they are cooked. Brook trout are fighters, and they are hard to catch. It is like playing a game to catch them. Many fishermen like to play the game of catching trout.

Many water birds and some insects find that young trout make good food.

Water beetles and other water insects eat trout eggs. They eat the tiny fish which have just come out of the eggs. Some water insects kill the big trout too. They eat holes in their sides. This makes the fish die.

Trout move very fast. They get away from many animals which want them for food.

They get away from many fishermen too. But, still, trout have a hard time to go on living.

They do not lay so many eggs as some animals do. Many animals use them for food. People have caught far too many trout. Soon they would be gone if people did not do something about it.

People have made places where trout can lay their eggs safely. Here the young fish can grow up safely.

There are few animals here to eat the eggs or the young fish. No men can catch fish here. When these fish are big enough, they are put into streams and rivers.

In most places people may not catch trout whenever they wish. They may catch them for only a short time in the year.

People want to keep trout in the streams and rivers. They are fine fish. They are helpful too. They eat insects which fly down to the top of the water. They help to keep the world from having too many insects.

Some trout live for many years. In cold winters they stay under the ice that covers the streams and rivers. In the spring, young and old ones swim again through the waters.

Skunks

Skunks are beautiful little animals. They are useful animals too.

Skunks are about as large as cats. They have little short noses and round bright eyes. Their fur is shiny black with white lines along their sides. Their tails are long and bushy.

When a skunk is afraid, up goes his tail over his back. People should go away as soon as the skunk puts his tail up over his back. That beautiful tail is a bad sign.

Early one morning Sarah Ann saw two baby animals. They were coming slowly along the walk which went from the barn to the garden. They were pretty little black-and-white things with long, bushy tails.

"You pretty little kittens!" she said.
"I must show you to my mother."



Sarah Ann put the little animals in her dress. She carried them to the house.

When Mrs. Smith saw them, she said, "Oh, dear me! You must let them go back where you found them. These are not baby kittens. They are baby skunks!"

Sarah Ann's father had told her about a family of skunks. He said that they were living in a hole under the roots of the big pine tree by the garden.

Then she thought of something more. She thought of Scotty, the dog. Once Scotty had gone too near a skunk. A very strong smell stayed with Scotty for many, many days.

People said, "Out of the way, Scotty! Keep out of the way!" They wouldn't let poor Scotty come near them until the bad smell had left his fur.

Sarah Ann did not want to take the skunk babies back to the barn.

"The mother skunk will not like to see me with her babies," she said. "I am afraid she will not like me because I took them away."

Sarah Ann took the baby skunks back to the place where she had found them. The mother skunk came back from the garden. She did not see Sarah Ann. She took her babies back to their nest under the roots of the old pine tree. Sarah Ann was safe.



What if the mother skunk had seen Sarah Ann with her babies? What do you think she might have done?

Under the skunk's tail are two little bags. When skunks are afraid, they throw out a liquid from these bags. This liquid has a very bad smell. Wherever this liquid falls, there is a bad smell for a long, long time.

Skunks are not often caught by other animals. Most animals keep far away from them.

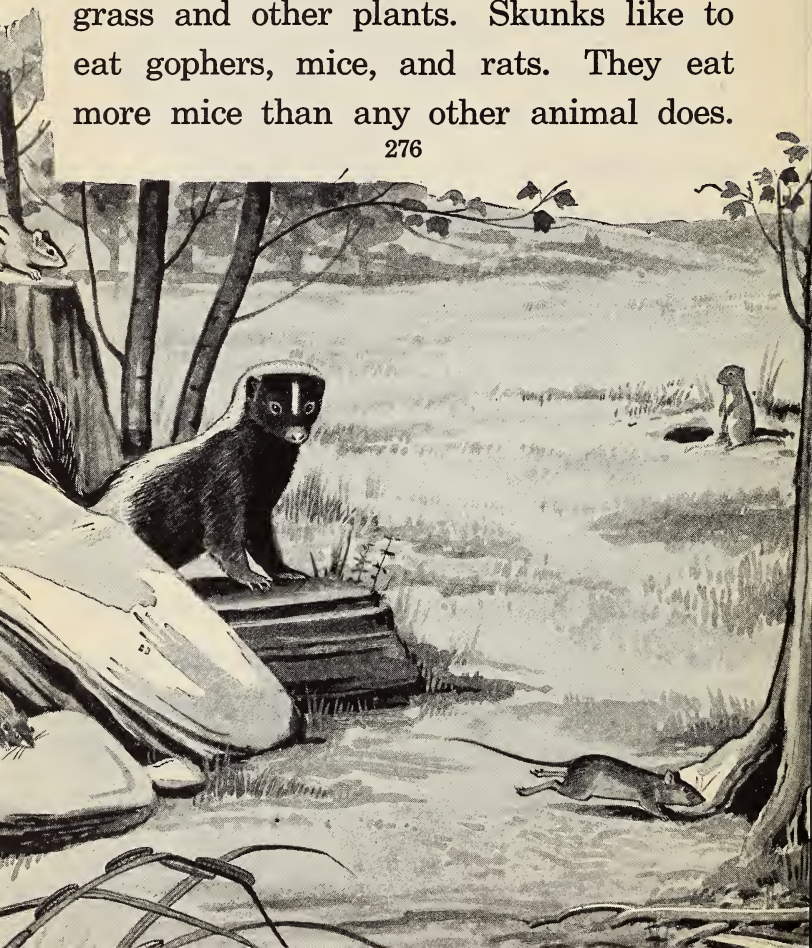
Some people say, "Oh, skunks are no good. They eat birds' eggs. They catch the farmers' chickens."

But skunks do not always eat birds' eggs and chickens. They like crickets, grasshoppers, and June beetles just as well. Skunks eat eggs and chickens when other foods are hard to get.

Skunks are good friends of the farmer. Many different kinds of worms are eaten by skunks. Many of these worms get into the farmer's wheat heads, grasses, and corn. They often kill these plants.

Farmers do not like mice, rats, pocket gophers, and ground squirrels. Mice and rats eat farmers' grain and vegetables. Pocket gophers make long tunnels under the fields. They eat the roots of the grass and other plants. Skunks like to eat gophers, mice, and rats. They eat more mice than any other animal does.

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Skunks can make a very good dinner from earthworms too. They like berries and other fruit. Skunks eat almost any kind of food. But much of their food is something which people want to have out of the way.

Skunks like to eat bees too. A skunk catching bees is very funny.

"Scratch, scratch!" go his front feet on the outside of the bee house.

"Scratch, scratch!" until the bees come buzzing out to send him away. You know what the bees do to try to send the skunk away.

But the skunk catches them and has a good dinner. The bees light on his fur, but the skunk doesn't care. He pulls the bees off and eats them.

No farmer wants skunks to eat his bees. But he can put the bee houses in high places out of the way of the skunks.

Skunks work mostly at night. You can see that black is a very safe color for them. The line of white helps them too. It makes the skunk's body look like a black shadow.

When the sun has set skunks come out to catch grasshoppers and June beetles. When the insects hop up from the ground, the skunks jump at them. They catch them with their front feet.

Long toes make these front feet look like little hands. Sometimes skunks dig beetles out of the ground with their long toes. Fine little holes are left when they are through.

How can a skunk find his food at night? Grasshoppers, beetles, and other insects are very small to find in the dark.

The skunk uses more than his eyes to find his food. He uses his ears and his nose. His ears hear the tiny sounds which the insects make as they move about. His nose smells many kinds of food.

Skunks sleep during very, very cold weather. They stay in their homes and sleep and sleep. Sometimes as many as twenty skunks sleep in the same hole.

Skunks will not dig their own holes if they can find another place to sleep. They are glad to live in homes left by other animals. Skunks use the old homes of woodchucks, badgers, or other animals.

When the winter days are warm, the skunks wake up for a little while. They walk about looking for food. When the weather turns cold again, they go back to sleep in their nests.

Their nests are found in all kinds of places. They sleep in holes under tree roots and fallen trees. Families of skunks have been found under floors of barns, farm buildings, and country school houses. They have even made their homes under people's houses.

Their soft nest is made of leaves and dry grass. Early in the spring there are from six to twelve babies in the warm, soft nest. They are not pretty babies. Their eyes are shut, and they have no fur. The mother gives them good care. They cannot care for themselves.

After three weeks their eyes are open, and they are much stronger. Then the mother brings mice and insects to them.

Soon they can go about with their mother to get food. The young skunks walk in a row after their mother. Then no little skunk gets lost. They stay with the mother until they are almost full-grown.

They are really "grown up" when they are six months old. They often stay with the mother after they are grown up. The family stays together through the winter.

If you should see a skunk, what would you do ?

The girls in a summer camp used to watch some skunks at night. The skunks would run up and down the yard of the camp. Sometimes they would stop and look for food. Many times they ran on until they came to a field that was on the other side of the yard.

The girls would sit up in bed to watch the skunks go by the camp. They never made the skunks afraid. The skunks did not throw out their bad-smelling liquid. They did not need to do so. They were as safe as safe could be !

THINGS TO THINK ABOUT

You have been reading about many kinds of animals. Animals live in many kinds of places. They have many kinds of ways of getting food. There are many ways for animals to move about. They have many kinds of ways for keeping away from other animals.

Some kinds of animals live a long, long time. Other kinds of animals live only a very short time. Some animals give their babies great care. Some animals give no care at all to their young.

There are many other kinds of animals in the world. They have many other ways of living. Can you tell about other kinds of animals?

Try to find out about some kinds of animals that are new to you. You could read about animals until you are grown up. But there would still be many kinds of animals to find out about.

It takes all kinds of living things to make up this wonderful world.

VOCABULARY

The vocabulary of "Changes All Around Us" has been carefully selected in order to hold reading difficulty to a minimum. A list of the assumed words is given in the teachers' manual which accompanies this book.

In addition to the assumed words, 329 new words have been introduced gradually. No more than four new words appear for the first time on any one page, and every new word is used a minimum of three times. All variants are counted as new words except those formed by the addition of *-s*, *-es*, *'s*, *-d*, *-ed*, *-ing*, *-er*, *-est*, *-ly*, *-y*, and *un-*. Compounds, whether hyphenated or not, are not counted as new words if the separate parts have already been learned.

The following list includes the new words by pages:

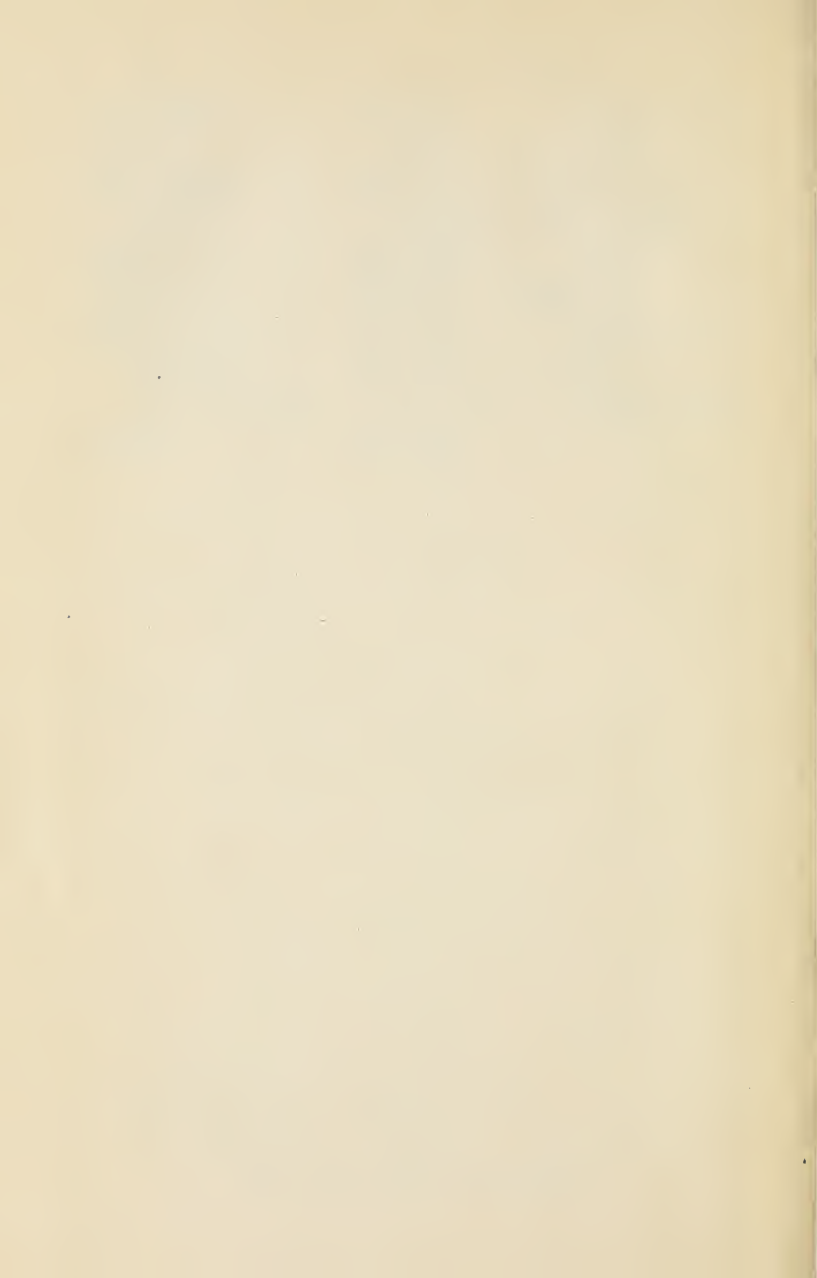
New Words by Pages

7. weather	14. floods	Jane
fog	become	22. horns
8. Bill	cities	seem
thunder	save	drive
storm	15. sunny	24. useful
10. flash	dries	freeze
lightning	families	killed
boom	16. wear	25. ever
branches	clothes	minute
11. fences	feels	outside
buildings	uncomfortable	rest
roof	18. sound	26. thin
dirt	drops	fingers
12. dandelion	spots	forms
Gordon	thick	part
13. Bob	21. wonder	27. question
reservoirs	smoke	skating
Rachel	nothing	28. sleds

- often
 29. mud
 safe
 31. course
 world
 different
 snowflakes
 32. flat
 flour
 alike
 33. changes
 36. break
 themselves
 begin
 roots
 37. suppose
 shorter
 plan
 39. bushes
 41. stems
 leaf
 42. hairs
 43. easily
 lettuce
 heart
 45. storehouses
 late
 dead
 46. carrots
 beets
 turnips
 47. meal
 eight
 deal
 48. bulbs
 onions
 narcissus
 49. fibers
 perhaps
50. blossoms
 smell
 empty
 51. page
 53. tiny
 twigs
 hundreds
 55. itself
 folded
 57. without
 meat
 even
 fruits
 58. sign
 wrote
 59. blackboard
 eaten
 60. peas
 wheat
 celery
 potatoes
 61. spinach
 cabbage
 cauliflower
 asparagus
 62. berries
 muskrats
 deer
 63. taste
 64. means
 65. bark
 66. South
 busy
 wrens
 swallows
 67. acorns
 puffing
 evergreen
 quickly
68. during
 oats
 70. crickets
 buzz
 katydids
 71. die
 kept
 laid
 parents
 72. July
 73. cocoons
 grown
 moths
 caterpillar
 74. bodies
 between
 own
 hangs
 75. crawl
 76. young
 77. beetle
 June
 August
 79. frost
 80. beavers
 swamp
 bank
 stream
 81. tunnel
 pile
 cozy
 82. naps
 such
 raccoons
 badgers
 84. wakens
 86. skunks
 fallen
 mice

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|--------------------|-----------------|-------------------------|
| 88. chip | 118. sauce | 150. seashore |
| pine | boiled | 155. countries |
| cones | 119. didn't | 157. true |
| pockets | 121. send | 158. silver |
| 89. grains | breath | 159. thousands |
| 90. teeth | apart | 160. miles |
| 91. corner | 122. throw | 162. really |
| 92. enemies | 123. family | 169. month |
| 93. moss | 127. cough | 172. camp |
| 94. paths | sneeze | 175. farther |
| 95. wolves | 131. sweaters | measure |
| himself | 132. yourselves | 176. bump |
| 96. yourself | 134. numbers | 179. bones |
| 98. woolen | degree | 182. Emily Ann |
| 99. babies | zero | radios |
| underwear | real | telephones |
| 100. cotton | 135. bite | rode |
| linen | 136. indoor | 185. fan |
| 101. furnace | 137. doctor | 186. power |
| oil | fever | 187. wires |
| 102. steam | sick | 190. cell |
| carried | 138. understand | posts |
| stove | twelve | 192. ting-a-ling-a-ling |
| 103. fireplaces | o'clock | 197. worn |
| chop | 140. Lucy | 204. mountains |
| 104. Helen | rise | 206. clay |
| canned | 142. noon | 209. pound |
| 105. peaches | hours | 210. waves |
| pears | afternoon | sea |
| jelly | 144. set | sandpaper |
| plums | darkness | 211. shore |
| 106. grapes | 145. supper | 214. hit |
| 107. doesn't | evenings | 217. tap |
| healthy | games | flag |
| 109. strawberries | electric | 219. carries |
| 110. refrigerators | 147. stood | lie |
| 111. ago | tonight | 227. granite |
| 112. wouldn't | 149. flashlight | passed |
| 116. handkerchief | sunshine | 228. layers |

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|------------------|---------------|----------------|
| giant | blood | 259. noisy |
| 230. rubbish | 245. body | fighters |
| 231. load | ponds | 264. helpful |
| 232. sandstone | 246. larva | 266. fins |
| 233. millions | wiggler | 268. fishermen |
| shale | wiggles | 271. Sarah Ann |
| 236. toes | 247. upside | kittens |
| 240. wonderful | 248. pupa | 273. Scotty |
| 243. ribbon | 251. loud | 275. liquid |
| 244. mosquitoes | 252. twenty | grasshoppers |
| bullfrogs | 255. inches | 276. rats |
| English sparrows | 256. escaping | pocket gophers |
| trout | plop | 277. scratch |
| 244. tube | 258. caught, | |



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